BULLETIN No. 1.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

NOTES ON

GRASSES AND FORAGE PLANTS

OF THE

SOUTHEASTERN STATES.

BY

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WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1895.

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., September 19, 1895.

SIR: I have the honor to transmit herewith for publication some notes on the grasses and forage plants of the Southeastern States, prepared by my assistant, Thomas H. Kearney, jr. These notes are based upon direct observations in the field, made in accordance with a commission from the Secretary of Agriculture under date of June 18, 1895. In accordance with his instructions Mr. Kearney visited Knoxville, Tenn.; Selma and Mobile, Ala.; Tallahassee, Apalachicola, Jacksonville, and St. Augustine, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., and Norfolk, Va. He was directed to note all the species of grasses at the several points visited, and to gather all facts obtainable relative to them which might be of scientific or economic interest.

Material assistance in accomplishing this work and much valuable information concerning the grasses and other forage plants of their respective localities was furnished by Dr. Charles Mohr, of Mobile, Ala.; Dr. A. W. Chapman, of Apalachicola, Fla.; Judge R. C. Long, of Tallahassee, Fla., and Capt. W. W. Woolsey, of Aiken, S. C.

The paper here presented is divided into two parts—the first, devoted to forage plants of actual or possible value, the several kinds being enumerated in alphabetical order for more ready reference; the second comprises a list of all the species of Gramineæ collected or seen, arranged according to their natural classification, with observations of purely botanical interest. This arrangement of the matter separates the economic from the scientific portions of the report, which will be appreciated alike by the farmer and the botanist.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

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PART I.

ECONOMIC NOTES UPON THE GRASSES AND OTHER FORAGE PLANTS OF THE REGION TRAVERSED.

Very few plants are widely cultivated in the South for hay or pasturage, the farmer relying for the most part upon the wild grasses. These may be roughly divided into two classes—the first comprising introduced grasses, mostly annuals, which spring up on cultivated land after the regular crop has been removed; the second, native grasses, the majority perennials, which make the bulk of the pasturage. Of the first class by far the most important is crab grass (*Panicum sanguinale*), which forms a great part of the volunteer hay crop of the South Atlantic and Gulf States. With it are often associated crowfoot or barn grass (*Eleusine indica*), little crowfoot (*Dactyloctenium ægyptiacum*), pigeon grass (*Setaria glauca*), and, in the far South, spur grass (*Cenchrus echinatus*) and Mexican clover (*Richardsonia scabra*). Of the native, perennial grasses perhaps the most important belong to the genus *Paspalum*, Louisiana grass (*Paspalum platycaule*) being the most common and best known. *Panicum serotinum* is also a valuable pasture grass over extensive areas. The broom sedges (Andropogon species), early in the season, make the bulk of the grazing on thin dry soils. Three other widely known forage plants, belonging to neither of these classes, must be mentioned. Johnson grass, dreaded as a weed yet esteemed as a forage plant, is an introduced perennial grass, highly valued for hay. Japan clover (*Lespedeza striata*) is perhaps the most valuable pasture maker, for the largest area, in the Southern States, while both for hay and for grazing "Bermuda" is king among grasses throughout the South.

ALPHABETICAL LIST OF THE GRASSES AND OTHER PLANTS OF THE SECTIONS VISITED WHICH ARE OR MAY BE OF IMPORTANCE AS FORAGE.

[With economic notes.]

AGROSTIS ALBA VULGARIS. (*See* Redtop.)

AGROSTIS PERENNANS.—In northern Alabama this grass remains green nearly all winter in damp, sheltered ground, and affords good pasturage.

ALFALFA.—Alfalfa is cultivated with great success near Augusta, Ga.

ANDROPOGON.—Several species of Andropogon, or broom sedge, of which *A. Virginicus* is the most common, are esteemed for pasturage in the South, as they flourish in very poor soils. In spring, while tender and juicy, they afford a fair amount of nutritious grazing; but as they mature they become dry and hard. At Tallahassee, Fla., they are considered by some as almost, if not quite, the most valuable pasture grasses of Leon County.

ANTHÆNANTIA VILLOSA.—This grass is frequent in dry, sterile pine barrens around Jacksonville, Fla., but never grows in great quantity. Otherwise it might be of some value, as the tufts of rather broad, tender root leaves should afford better grazing than most grasses of the pine barrens.

FIG. 1.—Broom sedge (*Andropogon virginicus*).

ARISTIDA STRICTA, the "wire grass" which covers large tracts of the pine barrens in the South Atlantic and Gulf States, is said to constitute a large part of the pasturage of the "barrens." It must be eaten when very young, for in July, though still immature, it was quite dry and hard, with rigid, wiry leaves. I have never seen the tufts cropped where cattle were grazing.

BARN GRASS. (*See Eleusine indica.*)

BARNYARD GRASS. (*See Panicum crus-galli.*)

BEGGAR WEED. (*See Desmodium tortuosum.*)

BERMUDA GRASS (*Cynodon dactylon*).—Perhaps no one plant represents more of value to the South than does "Bermuda;" certainly no other forage plant is more precious to that section. Whether for hay or for pasturage, it is everywhere placed first, and is considered the most nutritious grass that can be successfully grown in the Southern States. While it requires a fertile soil for its best development, it will grow on the thinnest soil, being a common plant of

seabeaches. In such situations the plants are very small, the erect, flowering stems being quite short, and long, sterile shoots (sometimes 6 feet long), rooting at every joint, are produced. In better land—a light, loamy soil seems to suit it best—the tendency to send out long, creeping shoots is checked, the upward growth is much greater, and the amount of leafage increases correspondingly, the whole plant becoming more tender and succulent. Besides its great value as a forage plant, Bermuda is one of the most effective of soil holders. When growing on sandy river banks and ocean beaches it is, apparently, the most valuable sand-binding grass of the Southern States. It is sometimes planted by road-

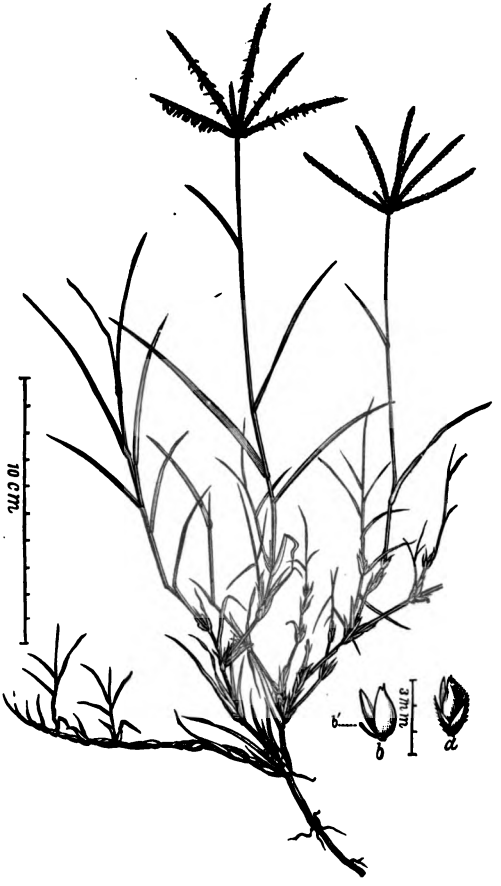

FIG. 2.—Bermuda grass (*Cynodon dactylon*).

sides and upon embankments for this purpose, and is a favorite lawn grass in most towns and cities, forming a close, fine turf, and remaining green in the driest and most sun-exposed stations.

BIG CROWFOOT. (*See Eleusine indica.*)

BROMUS UNIOLOIDES. (*See* Rescue grass.)

BROOM SEDGE. (*See Andropogon.*)

CENCHRUS ECHINATUS.—This grass, known as "spur grass" in Florida, is a common weed of cornfields and of cultivated land generally in that State and elsewhere in the far South. When young, before the bur-like coverings of the flowers are developed, it is said to make excellent hay, being tender and nutritious, and pro-

ducing a considerable bulk of forage. But the burs, when mature, make the plant a troublesome weed, though not so formidable as the related sand spur (*C. tribuloides*). Judge R. C. Long, at Tallahassee, places this fourth among the spontaneous hay-making grasses of Leon County, Fla.

COWPEAS.—This is the most widely cultivated, in its several varieties, of leguminous plants in the South and highly valued, not only for its excellent forage qualities, but also as a restorer of exhausted soils As a crop for rotation with corn or other cereals, it is apparently unsurpassed. It is grown almost everywhere in the South Atlantic and Gulf States.

CRAB GRASS (*Panicum sanguinale*).—Crab grass is generally considered the best hay grass of the Southern States. It is never cultivated in the ordinary sense, but comes up spontaneously on arable land after the cultivated crop is taken off.

FIG. 3.—Crowfoot (*Eleusine indica*).

Sometimes the ground is lightly rolled, but that is the only preparation made for it. After a crop of corn or cotton, one, or sometimes two, good catches of crab hay are made on the land. On account of its rapid growth crab grass is peculiarly adapted for its functions as an after crop. In good soil, when favored by sufficient rain, it attains considerable size. At Mobile it was seen nearly 4 feet high. It is a tender grass and makes a sweet hay, but is slow to give up its moisture, and therefore rather difficult to cure. When allowed to get the better of the cultivator, it becomes a troublesome weed, but with ordinary care is easily subdued. With it are usually associated, in cultivated land, crowfoot (*Eleusine indica*), little crowfoot (*Dactyloctenium ægyptiacum*), and sometimes Mexican clover (*Richardsonia scabra*) and spur grass (*Cenchrus echinatus*), also sprouting crab grass (*Panicum proliferum*). At Aiken I saw a large lawn, quite a good-looking one, composed almost exclusively of this grass.

CRIMSON CLOVER.—In east Tennessee this clover, if cut young, when the heads are just beginning to flower, yields a hay of excellent quality I was told at Tallahassee that this is the only clover which will stand the hot, dry summers there.

CROWFOOT. (*See Eleusine* and *Dactyloctenium.*)

CYNODON DACTYLON. (*See* Bermuda grass.)

CYPERUS ROTUNDUS. (*See* Nut grass.)

DACTYLOCTENIUM ÆGYPTIACUM, generally known as "little crowfoot," is held in considerable esteem as a hay grass in most parts of the South. Like crab grass, it appears spontaneously in cultivated land, and forms a more or less important element of the crop of grass which springs up after the corn or cotton has been taken off. It is usually considerably smaller than the big crowfoot (*Eleusine indica*), which it much resembles; but sometimes attains a very fair size. At Tallahassee it was observed 2½ to 3 feet in height.

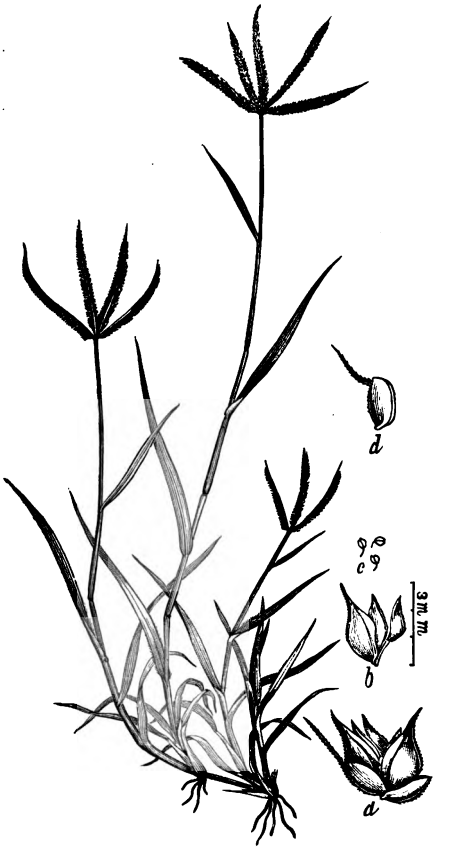

FIG. 4.—Little Crowfoot (*Dactyloctenium ægyptiacum*).

DESMODIUM TORTUOSUM (*D. molle*).—Valued for grazing in Leon County, Fla., where it is known as beggar weed. Other species of Desmodium form a part of the native pasturage and hay crop in the South.

ELEUSINE INDICA (crowfoot, big crowfoot, barn grass).—This, with crab grass, makes the great bulk of the "spontaneous" hay crop in most parts of the South. It is much more common than little crowfoot, which it resembles closely in habit, appearance, and quality. It is a larger plant, in fertile soil attaining a considerable height. It seems to do best in somewhat shaded ground. In an orchard

at Mobile I noticed a fine growth of it, averaging 3 to 3½ feet in height. Opinions differ as to its value. It is a rather tough grass, and becomes quite hard when growing in dry soil. I was told by several close observers that cattle will not touch it when grazing; and I noticed at Norfolk that cows browsing along the roadsides refused crowfoot altogether. Yet the general opinion is that, when cut young, it makes excellent hay, though troublesome to cure.

ERAGROSTIS CONFERTA.—Dr. Mohr tells me that this grass has some value for forage, being the only species of Eragrostis in the Southern States of any economic worth.

ERIOCHLOA MOLLIS.—This grass is frequent in the salt marshes of the St. Johns River near Jacksonville, Fla. It is a coarse, stout grass, usually 4 or 5 feet high, and would not produce a great bulk of forage, yet is probably the best grass that will grow in brackish soil thereabouts, and might be useful as a constituent of salt-marsh hay. It does not grow in great quantity in any one place and would be hard for cattle to reach, as it makes its home along ditches and among bushes on the edges of the marshes, or with the rushes and cord grass that cover the marshes themselves. It might be worth cultivating in brackish meadows where better grasses could not be grown successfully. I did not learn that it had been tested as to its nutritive qualities, nor do I know of any English name for it.

GERMAN MILLET, OR HUNGARIAN GRASS (*Setaria italica germanica*).—Does well at Apalachicola and makes excellent fodder. A good field of it was seen at Savannah. Largely cultivated about Augusta, Ga. Seems to be well adapted to the soil and climate of the Gulf and South Atlantic States, and is much esteemed as fodder for horses.

HOLCUS LANATUS (meadow soft grass, velvet grass).—Abundantly naturalized along railways in western North Carolina and east Tennessee, and is frequent by roadsides near Norfolk, Va., preferring moist ground. I have seen it nowhere grazed by cattle.

HUNGARIAN GRASS. (*See* German millet.)

INDIAN CORN.—Nothing that is new can be said about this, which is beyond question the most important fodder plant of the Southern States.

ITALIAN RYE GRASS (*Lolium italicum*).—Judge R. C. Long, at Tallahassee, says he has had fair success with this grass.

JAPAN CLOVER (*Lespedeza striata*).—For pasturage Japan clover, or, as it is more often called, Lespedeza, is probably the most important plant of the Southern States, if the extent of the area over which it occurs in important quantities be considered. It is rarely sown, but grows without cultivation, and soon covers the most sterile soils. On poor soil it is fit only for grazing, but in moist, fertile ground it becomes large enough to cut for hay. Cattle are said to prefer it to any other plant, except, perhaps, Bermuda, whether for pasturage or fodder. It is less common immediately along the coast than in the great interior region of the South, where it has made itself at home almost everywhere. It does best where there is some lime in the soil, yet it will grow well where lime is nearly or quite absent. At Aiken, S. C., it was growing abundantly in the pine woods. Capt. W. W. Woolsey, at Aiken, told me that if Lespedeza hay be put in the rack with other kinds cattle invariably eat the Lespedeza first. Mr. Dibble, who has a large dairy farm near Aiken, is sowing a large part of his land with Lespedeza. At Knoxville, Tenn., it is claimed that this Lespedeza drives out broom sedge.

JOHNSON GRASS (*Sorghum halepense*).—Doubtless the most widely cultivated perennial hay grass in the South. In the bulk of forage produced it surpasses any plant commonly cut for hay in that section. Like most large, coarse grasses, it must be cut when quite young, as the stems and leaves afterwards become hard and dry. Its great drawback is the difficulty of eradicating it when it once

takes hold of a piece of land. Many valuable plantations in Alabama and Mississippi have been almost ruined by the hold Johnson grass has obtained on the land. It is said to be eradicable by close grazing for several successive seasons. The best Johnson grass observed was near Selma, Ala., not far from where it is said to have been originally introduced (near Montgomery). Here it is abundant and grows taller and larger than anywhere else. In the low country along the Gulf and Atlantic Coast I found but little of it, and that comparatively poor. Again, at Augusta, Ga., and at Aiken, S. C., I found it very good. It is evidently best adapted to the central portions of the Southeastern States.

KAFFIR CORN (*Sorghum vulgare* var.)—Cultivated at Aiken, S. C., with success. On a large dairy farm near Aiken it is cut for ensilage, being mixed with Indian corn.

KENTUCKY BLUE GRASS (*Poa pratensis*).—Mr. Matthews, who has charge of the Government grass garden at Knoxville, tells me that *Sisymbrium thaliana*, a small weed belonging to the hedge mustards, nearly crowded out the plot of Kentucky blue grass in early spring. Kentucky blue grass is said to do well in shaded soil at Tallahassee, but it is probably not well adapted to withstand the long, hot summers of the Gulf States.

LESPEDEZA STRIATA. (*See* Japan clover.)

LITTLE CROWFOOT. (*See Dactyloctenium ægyptiacum.*)

LOUISIANA GRASS. (*See Paspalum platycaule.*)

MAIDEN CANE.—This name is sometimes applied to *Panicum digitarioides*, a tall, branched grass with long, creeping rootstocks and rather broad leaves, found chiefly in ditches in the low country along the coast from North Carolina to Texas. It is of some value for forage, but it is not sufficiently abundant to be of much importance; and, as it usually grows in ditches, it is not easy for cattle to get at. If cut when young its hay would probably compare favorably with most native grasses of the South. Small plants often grow in considerable patches on railway embankments near Jacksonville, and by their strong, long, creeping rootstocks make excellent soil binders. The name maiden cane seems to be applied to other species of Panicum, probably to *P. scabriusculum* and *P. viscidum*. The former is a smooth grass growing in swamps and around ponds, mostly in the pine barrens, and having about the same range as *P. digitarioides*, which it much resembles. It is readily distinguished, however, by its "head," which is an open panicle, instead of a long, thin, narrow spike as in *P. digitarioides*. It is of about equal value. *Panicum viscidum* is a very common grass in the Southern States, inhabiting ditches, swamps, and borders of ponds. It is much like *P. scabriusculum*, but is downy all over. When old it is much branched, the long stems reclining on the ground or on other plants. It makes a considerable bulk of very sweet hay, and is said to be much relished by horses and cattle. It is probably one of the most valuable native grasses of the South.

MEXICAN CLOVER. (*See Richardsonia scabra.*)

MILLO MAIZE (*Sorghum vulgare* var.).—Both white and yellow millo maize yield very profitable crops at Aiken, S. C. On a farm near that place a single acre of the white variety is reported to have yielded in one season 35 tons of ensilage, two cuttings having been made.

MISSION GRASS. (*See Stenotaphrum americanum.*)

MUHLENBERGIA DIFFUSA (Nimble Will).—Dr. C. Mohr tells me that in northern Alabama, in the valley of the Tennessee, this is considered an excellent pasture grass for shaded grounds.

NIMBLE WILL. (*See Muhlenbergia diffusa.*)

NUT GRASS (*Cyperus rotundus*).—This plant, perhaps the most pernicious weed of the Southern States, is said to have some value besides that of its tubers as food for hogs. According to Capt. W. W. Woolsey, of Aiken, S. C., horses eat it readily.

OATS.—Oats do well in river bottoms at Apalachicola, and make good winter feed. Oats are successfully cultivated at Aiken, S. C.

ORCHARD GRASS does excellently well at Tallahassee, Fla.

PANICUM AGROSTOIDES.—This is one of the chief constituents of the hay cut in the Mobile River bottoms.

PANICUM ANCEPS occurs along ditches, usually in small quantity and among other plants. Where cattle can get at it they appear to relish it, but it is not abundant enough nor productive enough to be of importance.

PANICUM ANGUSTIFOLIUM.—A meadow examined at Mobile was almost covered with this grass in the drier parts. I was told that cattle are fond of it. It is a common plant in woods in the middle and low country, forming, doubtless, an important element of the woodland pasturage.

PANICUM CLANDESTINUM.—Found at Mobile, occurring along fences in low meadows. Said to make good forage when young.

PANICUM COLONUM.—This is a tender, succulent grass, and is considered good forage in the South. It is a low plant, but makes a considerable bulk of stem and leaf. I saw it only in ditches in the cities and towns, and it is not likely that it is anywhere abundant enough to afford more than an occasional bite. I doubt if it would flourish in any but moist, alluvial soil. It might be grown to advantage in good bottom land.

PANICUM COMMUTATUM.—Found usually in fertile woods, and is probably of some importance for woodland grazing.

PANICUM CRUS-GALLI (Barnyard grass).—This is occasionally met with as a weed along railways and in waste ground. It is a rank, succulent grass, making a considerable bulk of forage. The hay is probably of fair quality, though rather difficult to cure. Resembles *P. colonum*, though much larger, and might be valuable in a similar soil.

PANICUM CRUS-GALLI HISPIDUM.—This is a tall, coarse grass, covered with rough hair, growing in marshes. It often stools at the base, forming tufts of considerable size, and is therefore very productive. The stems, though large, are full of water and comparatively tender. Seen at Tallahassee and also at Apalachicola, where it was reported that horses relish it greatly. Mr. Lewis, a farmer at Apalachicola, considers it one of the best grasses for horses if kept cut close.

PANICUM DICHOTOMUM.—Grows in similar situations as *P. commutatum* and is of equal value. In the South it is found mostly in the upper districts.

PANICUM DIGITARIOIDES. (*See* Maiden cane.)

PANICUM FUSCUM.—Introduced at St. Augustine, where it grows in the streets. Produces a considerable bulk of stems and leaves and may have some value as a forage plant. Is large enough to cut for hay, but is rather harsh when cured.

PANICUM MELICARIUM.—Grows in wet, open ground and is common in the middle and low country. Though a small grass, producing no considerable bulk of forage, it usually grows in considerable quantity and makes quite an important element of the natural pasturage. It is tender and juicy, making a fine, sweet hay. I was told at Mobile that it is much relished by cattle.

PANICUM PAUCIFLORUM.—This is a woodland grass, mostly of the middle country. I found it abundant at Augusta and Aiken. It is doubtless of some little value as an element of the woodland pasturage.

PANICUM PROLIFERUM GENICULATUM. (*See* Water grass.)

PANICUM REPENS.—Grows along the shores of Mobile Bay. It is a tough, rather rigid grass, but I have noticed it cropped by cattle, so it may have some value among the scanty pasturage of seabeaches. It is a good sand binder.

PANICUM SCABRIUSCULUM. (*See* Maiden cane.)

PANICUM SEROTINUM.—This common grass of the coast region of the South disputes with Louisiana grass the honor of being the most valuable native pasture grass of that section. It is probably a biennial, sending out leafy, creeping shoots that root at every joint. It is much like crab grass, but smaller in every way,

with shorter leaves and of a lighter green color. It is too low to be valuable except for grazing, though it makes a fine, sweet hay, much like crab hay, but of finer quality. It is invaluable for pasturage, forming a close turf and driving out almost all other plants. It grows in sandy soil, preferring a little moisture, but growing well without it. At Apalachicola, I found the bulk of the pasturage composed of *Panicum serotinum*. I know no popular name for it. "Little crab grass" would be appropriate.

PANICUM VISCIDUM. (*See* Maiden cane.)

PANICUM WALTERI.—A plant of fertile woods, much more common in the middle and upper country than near the coast. Resembles *P. commutatum*, but is every way larger. What is said of the latter as a forage plant would apply to this.

PASPALUM CILIATIFOLIUM.—Grows usually in rather fertile soil, preferring shade. May possess some little value, although I have never observed it being eaten by cattle grazing in fields where it grows. It is common everywhere in the South.

PASPALUM DILATATUM.—Not uncommon in the South. Is usually met with along ditches, growing in large tufts. Although rather coarse, it makes abundant hay of good quality. Dr. C. Mohr thinks it one of the best of the Paspalums.

PASPALUM DISTICHUM.—A common plant of ditches, borders of ponds, and river banks. It is a tender, succulent grass, sending up abundant leafy shoots; but, as it rarely grows in any quantity where it can be got at easily, is not of much importance. A variety growing on the Gulf shore sends out long creeping shoots which root at each joint, making the plant an effective sand binder. At Apalachicola I noticed that cattle cropped the upright stems of this variety, but left the creeping ones.

PASPALUM FURCATUM.—This species is much like Louisiana grass in appearance and habit of growth, but is larger in every way. It grows in moist soil, often along pine-barren streams, or along ditches by roadsides. From the root are sent out short leafy shoots, which creep along the ground and root at the joints, making a close turf. I have seen it only in small quantities, but it should make excellent pasturage, being juicy and tender. It is said to be much esteemed on the prairies at Opelousas, La., where cattle fatten upon it rapidly. It is valueless for hay, the leaves being mostly near the ground and the stems almost naked and wiry. It is a plant of the low pine-barren region.

PASPALUM LÆVE.—A common species in the South, growing in fields and meadows and along roadsides. Has some value as an element of the native pasturage, but soon becomes tough and wiry.

PASPALUM MEMBRANACEUM.—Noticed at Mobile and at Jacksonville in moist, sandy soil along railway tracks. It is a small grass, but is very tender and succulent, and ought to make excellent pasturage where it grows in sufficient quanity. As it is a perennial, with creeping rootstocks, it should be valuable in permanent meadows where there is sufficient moisture. For that purpose it might be mixed with Louisiana grass or with *Panicum serotinum*, if able to hold its own with them.

PASPALUM PLATYCAULE (Louisiana grass).—This grass is highly prized in the low country, though apparently not generally known as "Louisiana grass." It prefers moist, sandy, open ground, in such situations forming a close, tender turf. Dr. Mohr says that it shoots up with the first warm days of spring and affords grazing nearly all the year around. It is much like *Paspalum furcatum*, but is considerably smaller. It is abundant where it grows, and is probably the most valuable native pasture grass of that region. At Mobile I saw a large pasture, belonging to a dairyman, covered almost exclusively with Louisiana grass supporting a dozen or so of cows in fine condition. At Savannah I saw it larger and better than at any other point.

PASPALUM PLICATULUM.—Grows in tufts in dry, sandy, open ground in the pine barrens. I saw it from Mobile to Savannah. It is said to furnish fairly good

grazing when young, but soon becomes dry and the stems wiry. However, it is probably a better grass than most of those of the dry pine barrens. I saw it growing in dry soil on the banks of an artificial lake at Mobile, where the short, strong rootstocks made excellent soil binders.

PASPALUM PRÆCOX.—This species grows along ditches and streams and about ponds in the pine barrens. It is an erect grass with but little leafage, but is doubtless relished by cattle ranging the pine barrens, for when young it is quite tender and juicy.

FIG. 5.—Louisiana grass (*Paspalum platycaule*).

PASPALUM PURPURASCENS.—Grows in moist ground, preferring a rather heavy soil. I found it abundant in the middle and low country, and am convinced that it is one of the best hay grasses of the South. It grows in tufts and usually occurs in considerable quantities, crowding out most other grasses. It reaches a height of 4 feet or so, is perfectly smooth, very tender, and so sappy that the hands are wet in breaking a single stalk. It makes a good bulk of very sweet hay, although rather slow in drying. It is readily recognized by the red-purple color assumed by the leaves and stems toward the base. I found it common from Mobile to Wilmington along the coast and as far back as Augusta.

PEARL MILLET.—I noticed a small quantity of this cultivated at Jacksonville, but not doing well, perhaps on account of the dryness of the soil where it was grown.

POA ARACHNIFERA. (*See* Texas blue grass.)

POA COMPRESSA (Wire grass, English blue grass).—In the Government grass garden at Knoxville is a plot of this and Bermuda in mixture, forming an extremely dense turf. This mixture had endured for several years, neither grass having obtained a decided advantage over the other. Mr. Matthews, in charge of the garden, tells me that in spring and early summer, before the Bermuda begins to grow, the blue grass gets a good growth, and again in the fall when the growth of the Bermuda has ceased, so that one grass or the other would afford grazing throughout the season. In view of this, and of the ability of both grasses to withstand drought, this may prove a valuable mixture for the South. But it is doubtful whether the English blue grass will grow to advantage much farther South The blue grass may ultimately conquer the Bermuda, as its rootstocks penetrate much deeper into the soil. Dr. Mohr says *Poa compressa* is spreading rapidly in northern Alabama and is proving very valuable. He thinks it would finally drive out Bermuda if planted with it.

POA PRATENSIS. (*See* Kentucky blue grass.)

RED CLOVER.—Said to do well at Tallahassee. It is successfully grown at Augusta, Ga.

REDTOP (*Agrostis alba vulgaris*).—This grass is not uncommon in moist ground along railways and about wharves in the Gulf States, often growing vigorously in such places. I see no reason why it could not be grown successfully in the low country if given a moist, rather heavy soil. I am inclined to think that redtop could be cultivated to better advantage in that section than timothy, orchard grass, or the other staple hay grasses of the North.

RESCUE GRASS (*Bromus unioloides*).—Dr. C. Mohr considers this a valuable grass in southern Alabama. Judge R. C. Long says it does fairly well at Tallahassee.

RICE.—Rice is grown by Mr. Lewis at Apalachicola for horse feed, for which he thinks it about as valuable as corn.

RICHARDSONIA SCABRA (Mexican clover).—This plant often appears in cultivated land after the crop has been taken off, and is usually associated with crab grass. I saw it nowhere large enough to make good hay. Opinions differ as to its worth. Dr. C. Mohr thinks it of some value. Judge R. C. Long, of Tallahassee, does not esteem it and keeps it out of his land. A gentleman who resides near Thomasville, Ala., described a succulent plant of sandy bottoms under the name of "water pusley," which I think must be the Richardsonia. He says it is very palatable to cattle and is excellent for green manuring.

SEA OATS. (*See Uniola paniculata.*)

SETARIA CORRUGATA.—Occurs in cultivated land near the coast and is sometimes an important element of the spontaneous hay crop. It is not productive enough to be of much importance.

SETARIA GLAUCA (Pigeon grass, yellow foxtail).—What has been said of *Setaria corrugata* will apply to this species also, though *S. glauca* is more productive.

SETARIA GLAUCA LÆVIGATA.—This variety is found chiefly along the coast, although I noticed it at one point in the interior (at Augusta, Ga.). At Mobile I saw it in moist but not brackish ground, making a heavy growth and promising a large bulk of hay. It seems to be much more productive than common pigeon grass, and might be valuable for river bottoms. It grows in both fresh-water and brackish swamps.

SETARIA ITALICA GERMANICA. (*See* German millet.)

SIDA SPINOSA.—Judge R. C. Long informs me that this plant, though now abundant at Tallahassee, is a recent introduction there; says it is admirable for restoring exhausted top soils, as the roots extend deep into the subsoil, and that it makes very good winter grazing for cattle.

SMUT GRASS. (*See Sporobolus indicus.*)

SORGHUM HALEPENSE. (*See* Johnson grass.)

SORGHUM VULGARE. (*See* Kaffir corn and Millo maize.)

SPOROBOLUS INDICUS (Smut grass).—This grass, everywhere naturalized in fields and waste ground in the South, is much esteemed for pasturage, especially for horses. As it grows in tufts, sending out no shoots, it does not make a close turf. Capt. W. W. Woolsey, of Aiken, objects to it on this account. It is said to be highly nutritive. It will grow in very poor soil, but requires fertile land for its best development, under such conditions producing a considerable quantity of forage. Judge R. C. Long, of Tallahassee, thinks so highly of smut grass that he intends to plant a large area of land with it exclusively.

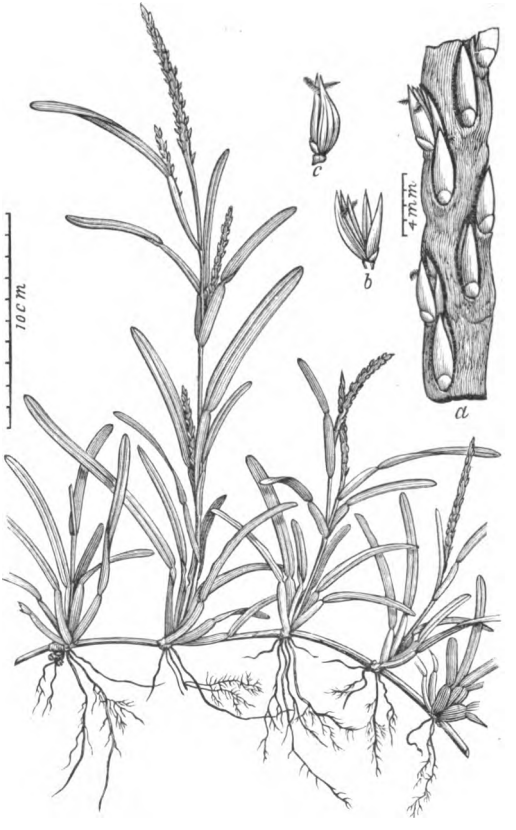

FIG. 6.—St. Augustine grass (*Stenotaphrum americanum*).

SPOROBOLUS VIRGINICUS.—This is a small grass growing on beaches along the coast. Its slender, creeping rootstocks, sending up tufts of stems at intervals, make it an excellent sand binder. The foliage is tender and may possess some value for seaside pasturage.

SPUR GRASS. (*See Cenchrus echinatus.*)

STENOTAPHRUM AMERICANUM (St. Augustine grass, Mission grass).—The lawn of Judge R. C. Long, at Tallahassee, is composed almost entirely of this grass, and I saw several other lawns at the same place composed solely of mission grass. I saw it also planted along the streets in Savannah. It makes a dense turf when kept close cut, and has a fresh, green color when growing in good soil. It is as well adapted to resist drought as Bermuda, and certainly makes a brighter, prettier lawn than that grass does. Judge Long says that with its

long, creeping shoots rooting at the joints it drives out all other grasses, even Bermuda, but is easily eradicated itself by plowing under. At St. Augustine, where it grows about the old Spanish fort, Bermuda grass was getting the better of it. Judge Long plants the grass as Bermuda is usually planted—by plowing with a hand plow, and placing short pieces of the stems in the furrows, and covering lightly with soil. It is a tender, succulent grass, in good soil making a considerable quantity of forage, and is said to be excellent for sheep pastures. It owes its name "mission grass" to its occurrence about the old missions in Florida and other States, where it was doubtless introduced by the Spaniards.

SWEET POTATO.—Capt. W. W. Woolsey, of Aiken, considers sweet potatoes excellent for horses, feeding about a peck each day with half rations of corn or oats. The vines he dries on racks and feeds as hay.

TEXAS BLUE GRASS (*Poa arachnifera*).—Judge R. C. Long stated that this grass flourishes in the stiff red-clay soil of Leon County, Fla., but does not thrive in thin sandy soils. Capt. W. W. Woolsey, at Aiken, has had good success with this grass, which affords excellent grazing late in winter and in spring. On his lawn it grows with Bermuda, neither grass seeming to crowd out the other. It took him about three years to get a good stand of it.

TRIPSACUM DACTYLOIDES.—A farmer at Apalachicola told me that this makes good fodder for horses if cut when young.

UNIOLA PANICULATA (Sea oats).—Grows in the sand of seabeaches, a little way above high tide. It is an excellent sand binder, its rootstocks being very strong and penetrating deep into the soil, much like those of marram grass, of which it is the Southern analogue. On St. Georges Island, off Apalachicola, Fla., I noticed the leaves cropped by cattle, but it is too tough and dry to be of any importance as a forage plant.

WATER GRASS (*Panicum proliferum geniculatum*).—This is a common grass of moist ground in the low country, found usually in alluvial river bottoms. It is a large, succulent grass, a rank grower, sometimes 7 feet high, the stout stems rooting at the lower joints. It produces a large bulk of stem and leaves, and is perhaps the most important native hay grass for bottom lands in the South. Is known and highly valued almost everywhere in that section. A physician of Thomasville, Ala., considers this, next to crab grass, the best forage plant of that part of the country

WIRE GRASS. (*See Aristida stricta.*)

PART II.

LIST OF GRASSES COLLECTED OR OBSERVED IN THE SOUTHEASTERN STATES FROM JUNE TO AUGUST, 1895.

MAYDEÆ.

Tripsacum dactyloides L.—Selma and Mobile, Ala.; Apalachicola, Fla.; Aiken, S. C.; Wilmington, N. C., in swales, along ditches, in graveyards, etc.

ANDROPOGONEÆ.

Elionurus tripsacoides HBK.—St. Georges Island, Fla., in dry pine barrens, growing in tufts among bushes. Culms slender, strict, 3 or 4 feet high, in tufts from short rootstocks. The roots have the delightful odor of vitivert (*Andropogon squarrosus*).

Andropogon argyræus Schult.—Aiken, S. C., in dry soil along railway.

Andropogon argyræus macra Scribn.—Jacksonville, Fla., dry, open ground in the pine barrens. Culms tall (nearly 6 feet), slender, little branched; whole plant glaucous. Very different in appearance from *A. argyraeus*. It is A. H. Curtiss's, No. 4952 (1894).

Andropogon Elliottii Chapm.—St. Georges Island, Fla., in dry pine barrens.

Andropogon provincialis Lam.—Aiken, S. C., in dry soil, hilly pine woods.

Andropogon scoparius Michx.—Hiwassee Gorge, Polk County, Tenn., in dry, sterile soil. Not in flower.

Andropogon Sorghum Halepense Brot.—Selma, Ala.; Augusta, Ga.; Aiken, S. C., in fields, at roadsides, etc.

PANICEÆ.

Paspalum ciliatifolium Michx.—Selma, Ala.; Tallahassee, Apalachicola, and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., fields, roadsides, etc. The ordinary form, found usually in rather fertile, shaded ground, is almost perfectly smooth, except the ciliate margins of the leaves. A very hairy form, growing in dry, sterile soil, observed at Mobile, Tallahassee, and Savannah, is probably *P. dasyphyllum* Ell.

Paspalum difforme Le Conte.—Mobile, Ala.; Jacksonville, Fla., in rather fertile soil along railway tracks. Resembles *P. floridanum glabratum*, but smaller in every respect.

Paspalum dilatatum Poir.—Mobile, Ala.; Augusta, Ga., in moist ground along ditches.

Paspalum distichum L.—Knoxville, Tenn.; Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Wilmington, N. C., in ditches, about ponds, river banks, and ocean beaches. On the beach at Apalachicola I found sterile shoots 6 feet or more in length, making excellent sand binders. A small form (*P. vaginatum* Sw.?), found in moist soil on the beach at Apalachicola, lacked the characteristic bluish color of the species.

Paspalum floridanum Michx.—Selma and Mobile, Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., in moist or dry, open ground. Varies considerably in degree of pubescence.

Paspalum floridanum glabratum Engelm.—Mobile, Ala.; Jacksonville, Fla., moist, open ground, usually along railways, less frequent than *P. floridanum*, flowering at the same time. Very conspicuous for its blue-glaucous color, which extends even to the spikelets. Is probably a distinct species.

Paspalum furcatum Flugge.—Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C. moist, open ground along ditches and streams in the pine barrens.

Paspalum læve Michx.—Selma, Ala.; Tallahassee and Jacksonville, Fla.; Savannah, Ga.; Aiken, S. C.; Wilmington, N. C.; Norfolk, Va., fields, roadsides, moist meadows, etc. Varies from very hairy to quite smooth, and in the size of the spikelets. A form collected at Jacksonville, very smooth, with several spikes, seems to approach *P. purpurascens*.

Paspalum membranaceum Walt.—Mobile, Ala.; Jacksonville, Fla., moist, sandy, soil, along railway tracks; not common.

Paspalum platycaule Poir.—Selma and Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Savannah, Ga., moist, sandy soil in low meadows, roadsides, etc., usually very abundant.

Paspalum plicatulum Michx.—Mobile, Ala.; Jacksonville, Fla.; Savannah, Ga., very dry open ground in the pine barrens. Resembles *P. læve*, but is more rigid.

Paspalum præcox Walt.—Mobile, Ala.; Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., about ponds and along ditches and streams in the pine barrens, in moist ground. Varies in degree of pubescence. Seems to flower "off and on" all summer.

Paspalum purpurascens Ell.—Mobile, Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Denmark, S. C.; Wilmington, N. C., in low meadows and along streams, in moist, rather heavy soil; common.

Paspalum setaceum Michx.—Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Savannah and Augusta, Ga.; Wilmington, N. C., in dry, sandy soil at roadsides and in fields; common in the pine barrens. Very distinct from *P. ciliatifolium*.

Paspalum virgatum pubiflorum Vasey.—Mobile, Ala., along a ditch in the city; introduced. Lower sheaths rough hirsute.

Anthœnantia villosa Benth.—Jacksonville, Fla., dry, sandy soil in pine barrens; frequent.

Amphicarpum floridanum Chapm.—Jacksonville, Fla., especially abundant upon railway embankments, also at roadsides and in cultivated fields, in rather loose, dry soil. Grows often in large patches, the slender, branched, creeping root-stocks making it an excellent soil binder.

Eriochloa mollis Kunth.—Jacksonville, Fla., brackish marshes of St Johns River. Sometimes over 5 feet high.

Panicum amarum minus Vasey and Scribn.—Norfolk, Va., ocean beaches, in drifting sands, just above high tide. Great majority of plants small and sterile. Root-stocks not penetrating deep, but much branched, making excellent sand binders.

Panicum anceps Michx.—Tallahassee and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., along ditches, usually in shaded ground. Plant collected at Wilmington is the large, nearly smooth, northern form, with larger spikelets. The others belong to the small-flowered southern form (*P. anceps pubescens* Vasey), with the lower sheaths pubescent or villous, whole plant often becoming purplish when growing in dry, open ground.

Panicum angustifolium Ell.—Mobile, Ala.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C. Two well-marked forms: one small, compact, much branched, growing in dry, open ground; the other larger, more straggling, less branched, darker green, preferring moist ground in the pine barrens.

Panicum autumnale Bosc.—Selma, Ala.; Augusta, Ga.; Aiken, S. C., dry, sandy soil, fields and roadsides, abundant at Augusta and Aiken. Leaves glaucous. Callus at base of panicle branches very prominent at period of flowering, glistening when held to the light, as if full of water.

Panicum baldwinii Nutt. in Herb. Phila. Acad. (*Panicum nitidum minor* Vasey Contr. U. S. Nat. Herb. 3: No. 1, 30, 1892).—Carrabelle and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., in fertile pine woods, or in moist, open ground.

Varies greatly in size, degree of branching, length of leaf, etc. The Wilmington plant, growing in low, wet, open ground, is minutely pubescent.

Panicum barbulatum Michx.—Polk County, Tenn.; Tallahassee, Fla.; Savannah and Augusta, Ga.; Wilmington, N. C., in moist, fertile, shaded ground along streams. At Savannah specimens were collected of a *Panicum* with the habit, panicle, and spikelets of *P. barbulatum*, but smooth at the nodes.

Panicum ciliatum Ell.—Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Wilmington, N. C., dry soil in pine barrens. Is certainly a distinct species.

Panicum clandestinum L.—Knoxville, and in Polk County, Tenn.; Mobile, Ala.; Wilmington, N. C., low fertile ground in thickets along streams.

Panicum colonum L.—Mobile, Ala.; Tallahassee, Fla., in ditches in the stree

Panicum commutatum Schult.—Knoxville, and in Polk County, Tenn.; Tallahassee and Jacksonville, Fla.; Augusta, Ga.; Norfolk, Va., in fertile woods. Varies much in size, length and breadth of leaves, etc.

Panicum crus-galli L.—Mobile, Ala., moist ground along railway.

Panicum crus-galli hispidum Torr.—Tallahassee and Apalachicola, Fla., in open swamps. Nearly 6 feet high at Tallahassee. Certainly native. Panicle lighter colored than in *P. crus-galli*.

Panicum demissum Trin.—Jacksonville, Fla.; Savannah, Ga., fertile open soil in pine barrens. It is No. 4029, A. H. Curtiss (1893).

Panicum dichotomum L.—Knoxville, and in Polk County, Tenn.; Aiken, S. C.; Norfolk, Va., in dry, fertile woods. Typical *P. dichotomum* seems to be scarce or altogether wanting in the low country.

Panicum digitarioides Carpenter.—Jacksonville, Fla.; Wilmington, N. C., in ditches and swamps. Ordinarily quite smooth. Small, sterile plants sometimes straggle into dry, open ground, especially upon railway embankments, and, with their branching rootstocks, make excellent soil binders. In such situations the plants are quite hairy. At Jacksonville these small plants often grow in large patches with *Amphicarpum floridanum*, which they somewhat resemble. The slender, spike-like, greenish panicles stand out at an angle to the axis of the culm.

Panicum filiforme L.—St. Georges Island, Fla.; Augusta, Ga., in dry soil. The southern form is larger, less strict, and more leafy at base than the northern.

Panicum fuscum Sw.—St. Augustine, Fla., sidewalks and vacant lots near the beach. Grows in tufts of considerable size, the culms reclining and rooting at the joints toward the base.

Panicum gibbum Ell.—Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Augusta, Ga., in moist ground, in thickets and fence rows, and along ditches and streams. The weak culms recline on the ground unless supported by other objects.

Panicum lanuginosum Ell.—Polk County, Tenn.; Aiken, S. C.; Wilmington, N. C.; Norfolk, Va., in dry, open woods, apparently more common in the middle and upper country.

Panicum laxiflorum Lam.—Tallahassee and Jacksonville, Fla.; Augusta, Ga., fertile, wooded hillsides or low woods. The southern form is smaller and narrower leafed than the northern.

Panicum longipedunculatum Scribn.—Wilmington, N. C., in pine barrens, preferring rather moist soil.

Panicum melicarium Michx.—Selma and Mobile, Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C., wet, sandy, open ground; common.

Panicum nodiflorum Lam. (?)—Mobile, Ala.; Wilmington, N. C.; Norfolk, Va., low meadows. Culms in tufts, sometimes 2 feet high, becoming much branched (not dichotomously), purplish; sheaths ciliate at throat and along edges with long, lax hairs, plant otherwise smooth (in Wilmington specimens leaves also ciliate); primary panicle small, many-flowered; secondary axillary panicles numerous, barely exserted, few-flowered; spikelets one-half line long, obovate,

often becoming dark purple; empty glumes minutely pubescent. I think this must be a good species. It is represented in the National Herbarium by specimens from several localities, all in the coast region. It seems to be nearest *P. barbulatum*, but can hardly be referred to that species.

Panicum pauciflorum Ell.—Augusta, Ga.; Aiken, S. C., dry soil in pine barrens.

Panicum proliferum Lam.—Augusta, Ga., low ground at roadside.

Panicum pubescens Lam.—Mobile, Ala.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., dry, barren woods. Varies somewhat in size of spikelets.

Panicum ramulosum Michx.—Jacksonville, Fla.; Aiken, S. C.; Wilmington, N. C., sphagnum swamps. It is No. 500 of Nash's Florida collection. The Jacksonville plant has stouter and more rigid culms than the common form. The same form was collected by S. M. Tracy on Horn Island, Mississippi.

Panicum ramulosum Michx.—Mobile, Ala.; Apalachicola and Carrabelle, Fla.; Wilmington, N. C., moist or dry soil in pine barrens, a smaller, more erect form, with culms less leafy toward summit, corresponding to *P. ensifolium* Baldw.

Panicum repens L.—Mobile, Ala., about wharves in the city and shores of Mobile Bay at least as far as Dog River (10 miles below Mobile).

Panicum sanguinale L.—At all points visited, in cultivated ground, roadsides, etc.

Panicum sanguinale ciliare Retz.—Carrabelle, Fla., along railway. Small specimens.

Panicum scabriusculum Ell.—Mobile, Ala.; Wilmington, N. C., in pine barren swamps. I have never seen this species producing the lateral autumnal panicles so abundant in *P. viscidum*.

Panicum serotinum Trin.—Mobile, Ala.; Tallahassee, Apalachicola, and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C., dry or moist sandy soil. Dr. Charles Mohr has never been able to determine whether this plant is annual or perennial. Its delicate, fibrous roots, having but a slight hold on the soil, seem to belong to an annual, while its creeping stems and early appearance in spring point to its being perennial. It is not improbably a biennial.

Panicum sphærocarpum Ell.—Selma and Mobile Ala.; Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C.; Norfolk, Va., in woods and on banks in dry, usually fertile, soil. Quite variable in size and habit.

Panicum stenodes Griseb.—Mobile, Ala.; Jacksonville, Fla., in wet pine barrens; scarce at Mobile, common about Jacksonville.

Panicum virgatum L.—Mobile, Ala.; Jacksonville, Fla.; Wilmington, N. C.; Norfolk, Va., usually growing in dry soil, but near streams or ditches. At Wilmington, in moist pine-barrens, a slender, reduced form with few-flowered panicles was collected.

Panicum viscidum Ell.—Selma and Mobile, Ala.; Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C.; Norfolk, Va., in swamps and along ditches; very common.

Panicum walteri Poir.—Knoxville, and in Polk County, Tenn.; Tallahassee, Fla.; Savannah, Ga., in fertile woods. All specimens collected had bearded nodes.

Setaria corrugata Schult.—Apalachicola, Jacksonville, and St. Augustine, Fla., in cultivated fields and waste ground. Grows in tufts, often of considerable size. The St. Augustine plant has the corrugations of the flowering glume less prominent.

Setaria glauca Beauv.—Mobile, Ala.; Savannah and Augusta, Ga.; Norfolk, Va., cultivated ground and roadsides.

Setaria glauca lævigata Chapm.—Mobile, Ala.; Apalachicola, Fla.; Augusta, Ga., in moist ground along ditches beside railway tracks; at Apalachicola in salt marshes along the coast. This, I think, is almost certainly a native grass and is, in all probability, a distinct species. It is easily recognized by its flattish culms, very glaucous leaves, and shorter spikes, with longer bristles than those of *S. glauca*. The rootstocks are short, knotted, horizontal, somewhat reminding one of those of *Muhlenbergia Mexicana*.

Setaria imberbis R. & S.—Mobile, Ala., about wharves; introduced from South America.

Cenchrus echinatus L.—Tallahassee and Jacksonville, Fla., in cultivated fields; at Jacksonville common in waste ground in the city.

Cenchrus incertus M. A. Curtis.—Mobile, Ala.; Augusta, Ga., in dry, sandy soil; at Augusta in cornfields.

Cenchrus tribuloides L.—Tallahassee, Carrabelle, Apalachicola, and Anastasia Island Fla.; Wilmington, N. C., in dry, sandy soil, seabeaches, roadsides, etc. Contains at least two varieties or possibly species. One (collected at Wilmington) has rather few, large involucres with stout spines. The other (collected at Tallahassee and Apalachicola) is a more slender plant, with more numerous, smaller involucres with slender, straw-colored spines. On Anastasia Island was collected a form of the large-flowered variety with long, straggling culms that support themselves on the bushes.

Stenotaphrum americanum Schrank.—St. Augustine, Fla., along Marine street and about the old fort. Probably originally planted there. Saw a number of seedlings growing out of the coquina walls of the fort itself.

ORYZEÆ.

Hydrochloa Caroliniensis Beauv.—Mobile, Ala.; Augusta, Ga., in clear, usually running water, most frequent in the pine barrens. Abundant about Mobile. Not seen in flower. The slender culms are often 2 feet or more in length, rooting at the lower nodes. In shallow water the summits of the culms appear above the surface, while in deeper water the uppermost leaves float upon the surface. Leaf blades dull green above, purplish beneath.

Zizaniopsis miliacea Doell & Asch.—Mobile, Ala.; Apalachicola, Fla.; Wilmington, N. C., in swamps and ditches, preferring alluvial mud. Sterile shoots erect, flowering ones strongly geniculate, rooting at the joints.

Zizania aquatica L.—Wilmington, N. C.; Suffolk and Norfolk, Va., in marshes near the sea.

Leersia hexandra Sw.—Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Wilmington, N. C., swamps, ditches, and borders of ponds. Much taller in Mobile River swamps, where it grew among *Spartina polystachya*, than I have seen it elsewhere. There, and at Wilmington, the spikelets were largely affected with an ergot-like disease. Specimens collected at Tallahassee have very large flowers. Spikelets reddish brown, turning a dull brown purple.

Leersia oryzoides Sw.—Norfolk, Va., in bogs.

AGROSTIDEÆ.

Aristida gracilis Ell.—Jacksonville, Fla., upon a railway embankment. A large form, same as No. 4043, A. H. Curtiss (1893).

Aristida purpurascens minor Vasey.—Apalachicola and Jacksonville, Fla., dry, sandy soil, in the open.

Aristida spiciformis Ell.—Apalachicola, Fla., in moist pine barrens.

Aristida stricta Michx.—Apalachicola, Fla.; Aiken, S. C.; Wilmington, N. C., dry pine barrens; abundant almost everywhere in the low country.

Stipa avenacea L.—Wilmington, N. C., in dry pine barrens. Still in flower August 3.

Stipa Neesiana Trin.—Mobile, Ala., about wharves; introduced from South America.

Muhlenbergia capillaris trichopodes Vasey.—Jacksonville, Fla., in dry soil, but always near ditches. The panicle has a whitish color.

Muhlenbergia Mexicana Trin.—Knoxville, Tenn., banks of Tennessee River; not yet in flower.

Phleum pratense L.—Polk County, Tenn.; Selma and Mobile, Ala.; Apalachicola, Fla.; Norfolk, Va., along railways and roadsides. At Mobile and Apalachicola a small form grew among driftwood on the beach.

Sporobolus curtissii Small (*Sporobolus floridanus curtissii* Vasey, in herb.).—Jacksonville, Fla., in pine barrens, growing in open ground along railways. A much

smaller, narrower-leafed, and in every way more delicate plant than *S. floridanus*. It grows in similar situations, but is much more common about Jacksonville. It is A. H. Curtiss's Nos. 4053, 5181.

Sporobolus floridanus Chapm.—Apalachicola and Jacksonville, Fla., rather moist ground in pine barrens. Grows in strong tufts, the dried sheaths at base of culms becoming hard and polished.

Sporobolus indicus R. Br.—Selma and Mobile, Ala.; Tallahassee, Apalachicola, and Jacksonville, Fla.; Savannah and Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., fields, roadsides, and along streets in the cities; almost everywhere in the South. Varies much in size and in the shape of the panicle, which is sometimes very narrow and spike-like, sometimes more open, with longer branches. Usually affected with smut.

Sporobolus junceus Kunth.—Jacksonville, Fla.; Aiken, S. C.; Wilmington, N. C., in dry pine barrens. In flower at Wilmington August 3.

Sporobolus virginicus Kunth.—St. Georges Island, Florida, on the beach, with *Paspalum distichum*. The slender, rather deep-seated rootstocks send up tufts of culms at intervals. As is usually the case with grasses with creeping rootstocks, a majority of the plants are sterile.

Agrostis alba vulgaris Thurb.—Polk County, Tenn.; Selma, Ala.; Jacksonville, Fla.; Savannah, Ga.; Norfolk, Va., along railway tracks, at roadsides, and about wharves. The form collected at Selma, Jacksonville, and Savannah is slender, very glaucous, with numerous sterile shoots, and grows in moist soil. In Polk County, Tenn., besides the ordinary "redtop," a slender, strict form, about 1 foot high, with small panicles, was collected along the Marietta and North Georgia Railroad in the Hiwassee Gorge.

Agrostis alba L. var.—Hiwassee Gorge, Polk County, Tenn., in wet ground. A large, succulent form, with stout geniculate culms and large panicles.

Agrostis scabra Willd.—Polk County, Tenn.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., in fields and roadsides.

Cinna arundinacea L.—Norfolk, Va., in marshes.

Ammophila arenaria Link.—Elizabeth River Beach, near Norfolk, Va., just above high tide. Grows in large patches, with here and there a fertile plant. Smaller here than farther north.

AVENEÆ.

Holcus lanatus L.—Asheville, N. C.; Polk County, Tenn.; Norfolk, Va., moist ground, roadsides, and along railway tracks.

Trisetum palustre Torr.—Hiwassee Gorge, Polk County, Tenn., on a wet rock—a single specimen.

Avena sativa L.—Hiwassee Gorge, Polk County, Tenn., adventitious along railway.

Danthonia sericea Nutt.—Mobile, Ala.; Aiken, S. C., dry pine barrens; past flowering.

Danthonia spicata Beauv.—Knoxville, Tenn.; Polk County, Tenn., dry soil, woods and fields.

CHLORIDEÆ.

Cynodon dactylon Pers.—At every point visited, except Polk County, Tenn. On the beach at Apalachicola occurs a reduced form, with small leaves and short flowering culms and spikes, which produces sterile shoots sometimes 7 feet long, making an admirable sand binder. Along the railway track opposite Augusta I found the large form 3 feet high.

Spartina densiflora Brongn.—Apalachicola and St. Georges Island, Fla., in the sea marshes, with *S. juncea*. Resembles *Ammophila* in habit and in the spike-like panicle, which is often purplish. Culms sometimes nearly 5 feet high. Rootstock penetrates deep into the sand, rooting at intervals, like that of *Ammophila*.

Spartina juncea Ell.—Mobile, Ala.; Apalachicola, St. Georges Island, and Jacksonville, Fla.; Norfolk, Va., in brackish marshes and on seabeaches. The southern form is much larger than the ordinary form of the New England and Middle States. When growing on beaches it sends out stolons, often 3 feet long, with purplish, polished scales. It takes firm hold of the sand and is excellent for binding it.

Spartina polystachya Ell.—Mobile, Ala.; Apalachicola, Fla.; Savannah, Ga.; Wilmington, N. C.; Suffolk and Norfolk, Va., in brackish marshes.

FIG. 7.—Toothache grass (*Ctenium americanum*).

Ctenium americanum Spreng.—Mobile, Ala.; Apalachicola and Jacksonville, Fla.; Wilmington, N. C., low, wet pine barrens. The bud of next season on the rootstock is snugly protected by the scaly bases of old leaf sheaths that clothe the base of the culm. The spikes, while young, stand out at right angles to the culm; but as they mature they become more or less curled. Occasionally a second smaller spike occurs, attached at the same point. This might be considered a vestige of the digitate inflorescence of other *Chlorideæ*. The leaves are quite glaucous beneath. When young, *Ctenium* has not much odor, but as the plants grow older, especially when exposed to the sun, the whole plant exhales a fragrance not unlike that of *Melissa officinalis*. I did not find the rootstock very pungent to the taste at this season.

Chloris glauca Vasey.—Jacksonville, Fla., in dry soil along a ditch near St. Johns River. This and the next species are probably biennial, the tufts of leaves at

the roots remaining green after the rest of the plant has become dry. The small fibrous roots can hardly belong to a perennial. The culms are strongly geniculate, sometimes 4 feet high. It is a very handsome plant.

Chloris Swartziana Doell.—Apalachicola and St. Augustine, Fla., dry, sandy soil.

Gymnopogon brevifolius Trin.—Jacksonville, Fla., in moist, open ground.

Gymnopogon racemosus Beauv.—Aiken, S. C., fertile, wooded hillside.

Eleusine indica Gaertn.—At every point visited. In the streets of Savannah specimens with viviparous spikelets were collected. The spikelets were metamorphosed into tiny branches with well developed leaves, showing a perfect definition of sheath and blade.

Dactyloctenium ægyptiacum Willd.—Selma, Ala.; Tallahassee, Fla.; Savannah, Ga.; Aiken, S. C., roadsides and cultivated ground. Along the sidewalks at Savannah a small form, with short and compartively thick spikes, was collected.

Leptochloa mucronata Kunth.—Mobile, Ala., in cultivated ground.

FESTUCEÆ.

Phragmites communis Trin.—Mobile, Ala., in swamps of Mobile River. Not yet in flower (July 7).

Triodia ambigua Vasey.—Mobile, Ala.; Jacksonville, Fla., along ditches, in open ground, in the pine barrens. Grows in tufts; leaves glaucous.

Triodia cuprea Jacq.—Augusta, Ga., fertile soil along railway.

Triplasis americana Beauv.—Aiken, S. C., sterile, sandy soil, in the open.

Triplasis purpurea Beauv.—Carrabelle and Apalachicola, Fla.; Norfolk, Va., sea-beaches.

Eragrostis bahiensis Schult.—Mobile, Ala., about wharves; introduced from South America.

Eragrostis brownei Nees (?).—Tallahassee, Fla., along railway tracks. A handsome little plant, with bunches of bright-green radical leaves and small brown-purple panicles spreading out upon the ground. It is Nash's No. 1611.

Eragrostis ciliaris Link.—Apalachicola, Fla., in Dr. Chapman's garden.

Eragrostis major Host.—Norfolk, Va., roadsides.

Eragrostis nitida Chapm.—Savannah, Ga., along railway track.

Eragrostis pectinacea Steud.—Augusta, Ga.; Norfolk, Va., dry, sandy fields.

Eragrostis pilosa Beauv.—Mobile, Ala.; Tallahassee, Fla.; Augusta, Ga.; Aiken, S. C.; Norfolk, Va., roadsides and waste ground.

Eragrostis plumosa Link.—Carrabelle and Apalachicola, Fla., gardens and waste ground.

Eragrostis purshii Schrad.—Selma, Ala., along railway in moist ground.

Eragrostis refracta Scribn.—Tallahassee, Apalachicola, and Jacksonville, Fla.; Augusta, Ga.; Aiken, S. C.; Wilmington, N. C., in moist or dry, sandy soil, fields and roadsides.

Eragrostis sporoboloides Smith (Poa hirsuta Michx).—Selma, Ala.; Augusta, Ga.; Aiken, S. C.; Norfolk, Va., dry, sandy soil, usually in cultivated fields. Panicles sometimes 3 feet long. A perfectly distinct species.

Eatonia dudleyi Vasey.—Knoxville, and in Polk County, Tenn., dry, fertile, wooded hillsides.

Uniola gracilis Michx.—Mobile, Ala.; Tallahassee and Jacksonville, Fla.; Savannah, Ga.; Wilmington, N. C.; Norfolk, Va., usually in low, moist woods.

Uniola latifolia Michx.—Knoxville, Tenn., in rich soil, bluffs of Tennessee River. Not in flower.

Uniola longifolia Scribn.—Mobile, Ala., dry, fertile woods, summit of a low hill. Grew with *Uniola gracilis* and appeared very distinct. Is larger and coarser, more erect, and has a duller green color, while the hairy sheaths distinguish it at once.

Uniola paniculata L.—St. Georges Island, Florida, on the outer beach, between an undergrowth of sabal, etc., and tide mark; in large patches, most of the plants sterile. Takes the place on the coast of the Southern States of *Ammophila arenaria*, which it resembles in habit of growth, especially of the underground parts.

Distichlis maritima Raf.—Apalachicola, Fla., in salt marshes along the coast. Not in flower.

Poa compressa L.—Polk County, Tenn.; Norfolk, Va., dry soil, roadsides, etc.

Poa pratensis L.—Augusta, Ga.; Aiken, S. C., shaded ground at roadsides.

Festuca elatior pratensis Hack.—Norfolk, Va., roadsides.

Festuca Myurus L.—Norfolk, Va., roadsides.

Festuca nutans Willd.—Hiwassee Gorge, Polk County, Tenn., shaded ground.

Bromus ciliatus purgans A. Gray.—Knoxville, Tenn., fertile soil, wooded bluffs, on Tennessee River.

Bromus secalinus L.—Polk County, Tenn., along railway track.

Bromus unioloides HBK.—Mobile, Ala., about wharves; small specimens.

HORDEÆ.

Elymus canadensis L.—Hiwassee Gorge, Polk County, Tenn., on a shaded ledge of rock.

Elymus virginicus L.—Augusta, Ga., Aiken, S. C.; Norfolk, Va., along streams and ditches and in swamps.

BAMBUSEÆ.

Arundinaria macrosperma Michx.—Selma and Mobile, Ala.; Augusta, Ga.; Aiken, S. C., forming "canebrakes" on river banks and in swamps.

Arundinaria tecta Muhl.—Mobile, Ala., rich, moist soil, border of a pine-barren pool.

BULLETIN No. 2.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF AGROSTOLOGY.

FODDER AND FORAGE PLANTS,

EXCLUSIVE OF THE GRASSES.

BY

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Assistant Agrostologist.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1896.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., June 18, 1896.

SIR: I submit herewith for publication as a bulletin of this division, a descriptive list of fodder and forage plants, exclusive of grasses. The arrangement of the different kinds is alphabetical, according to the initial letter of their scientific or Latin names. There is added an alphabetical list of all the common or English names applied to these plants, with their Latin equivalents. The work is popular in its character, and is as free from technicalities as possible. The descriptions are brief, and the remarks under each species, while brief, include what has been regarded as most important, and afford such information as the farmer and others interested would be most likely to wish to know. Besides the cultivated forage plants which are already more or less widely known, native species which have never yet been cultivated are included in the enumeration. There are in the United States over 200 native or wild species of this class which are recognized locally as excellent forage plants. More attention should be given these natives, for there is every reason to believe that among them are many kinds fully equal in productiveness and feeding value to any of those now under cultivation, and possibly many superior to anything we have now in their adaptability to certain soils or climates or in their value for special uses. Among the species particularly worthy of attention in this connection are wild vetch (*Hosackia*), Beckwith's clover, buffalo pea, winter fat, prickly pear, sotol, and deer weed.

Respectfully,

F. LAMSON-SCRIBNER,
Chief of Division of Agrostology.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary of Agriculture.

ILLUSTRATIONS.

FODDER AND FORAGE PLANTS.

Achillea millefolium. Yarrow; Milfoil.

A perennial composite with simple stems, twice pinnately parted leaves, and white or pink flat-topped flower-clusters. Common in old fields and meadows throughout the eastern United States and extending westward through the prairie region. In this country it is usually considered a weed; but in Europe, and especially in England, is held to be a very valuable addition to sheep pastures.

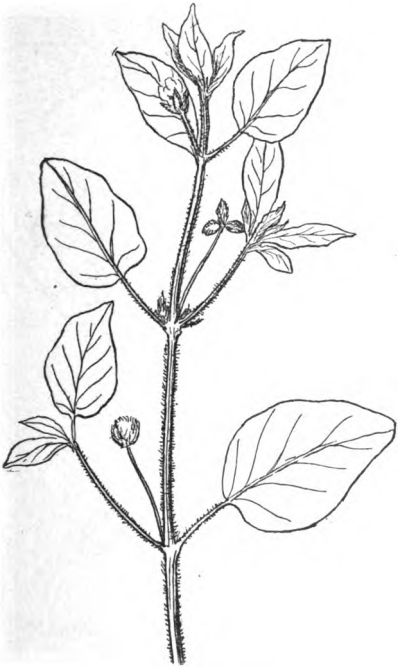

FIG. 1.—Gunaninpil (*Allionia incarnata*).

FIG. 2.—Tumbleweed (*Amaranthus blitoides*).

Adenostoma sparsifolium. Deer brush.

This rosaceous shrub and the closely related *A. fasciculatum* form an important part of the chaparral from the San Bernardino Mountains southward into Lower California. Stock feed upon them in winter and at other times when grass is scarce.

Allionia incarnata. Gunaninpil. (Fig. 1.)

A slender prostrate plant belonging to the Four O'clock family, which comes up from the seed after the summer rains in the grazing region of Arizona and New Mexico, and furnishes a palatable and nutritious food for sheep and cattle. It stands pasturing well, and usually ripens an abundance of seed.

Amaranthus. Bigweed; Pigweed; Tumbleweed. (Fig. 2.)

On the western ranges there are several species of Amaranthus which contribute to the forage. One of these, *A. blitoides*, comes up on new breaking, and with other weedy species is readily eaten by cattle before it has become woody. Because of their tumbling habit, they are rapidly scattered by the winds.

Amphicarpæa monoica. Hog peanut.

A wild bean, native of the woodlands and forests throughout the region east of the Missouri River, with two kinds of flowers; conspicuous ones borne on the upper portions of the plant which seldom ripen seed and inconspicuous fertile ones borne on slender stalks near the surface of the ground. The latter form fleshy subterranean pods, somewhat like those of the peanut. It is eaten greedily by all kinds of stock, and adds materially to the value of woodland pastures. The underground fruits furnish some food for swine.

FIG. 3.—Kidney vetch (*Anthyllis vulneraria*).

FIG. 4.—Peanut (*Arachis hypogæa*).

Anthyllis vulneraria. Kidney vetch; Common kidney vetch; Wound wort; Wound clover; Sand clover; Yellow sand trefoil; Lady's fingers. (Fig. 3.)

A low perennial legume, which is found wild over a large part of Europe. It grows naturally in very dry and sterile soils along the roadsides wherever the soil is thin and the subsoil calcareous. It is recommended as furnishing a palatable though scant forage on dry, calcareous soils in places that are too poor to support even white clover. The product of the first year is small, so that it is only a profitable crop when sown with grain. The second year the plants throw up tall stems, often 3 or 4 feet high. It is not recommended to sow this crop in the United States, except experimentally upon such barren soils as have been described, and then only after the better species have been tried and found to be failures.

Apios tuberosa. Ground nut.

A wild climbing bean, with milky juice and straight or slightly curved many-seeded pods, growing in low grounds, as far west as the Missouri River. It is eaten by all kinds of stock. The edible tubers, which furnish food for swine, are borne on underground shoots.

Arachis hypogæa. Spanish peanut; Peanut; Ground nut; Goober; Earth nut. (Fig. 4.)

An annual herb, a native of Peru and Brazil, introduced very widely in cultivation throughout the Southern States. The peanut is hardy as far north as Maryland. This is one of the most valuable fodder plants for the Southern States. There are two varieties—the one which furnishes the peanut of commerce, which requires a long season; and the Spanish peanut, which matures in about three months. The pods of the latter are smaller, and the seeds fewer and smaller,

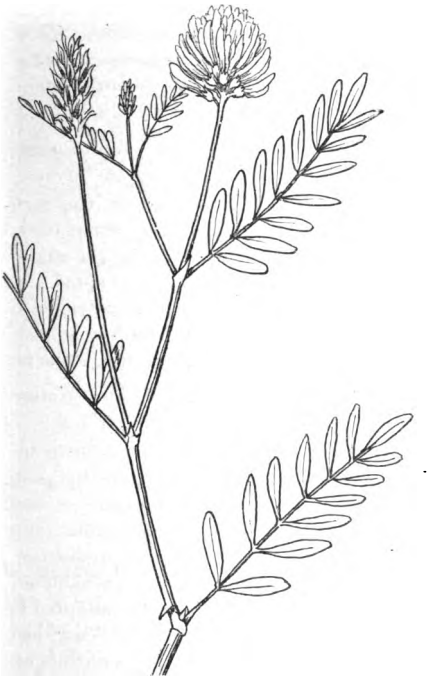

FIG. 5.—Buffalo pea (*Astragalus adsurgens*).

FIG. 6.—Australian saltbush (*Atriplex leptocarpum*).

than those of the edible variety. Peanut-vine hay is more nutritious than that of red clover. The yield of nuts ranges from 50 to 75 bushels to the acre. The Spanish peanut is the one usually grown for forage. The vines are pulled when the pods are about half formed, and are converted into hay by a method similar to that used in the treatment of cowpeas. The nuts or beans are rich in oil and albuminoids. Peanut meal makes a richer stock food than cotton-seed meal. A valuable oil can be expressed from the seeds.

Astragalus. Buffalo pea; Rattle pod. (Fig. 5.)

Herbaceous perennials, with pinnate leaves and usually conspicuous bean-like flowers, the pods becoming inflated when ripe. This genus is one of which there are about 100 American species distributed throughout the United States, the greatest number occurring in the prairie and Rocky Mountain regions. Some of the

species are, from their wide distribution and number of individuals, of great value on the native pastures of the West. Perhaps the most important of these are: *A. hypoglottis*, rattle pod; *A. caryocarpus*, the buffalo pea and buffalo clover of the plainsman; *A. canadensis*, Canada milk vetch; and *A. adsurgens*. The buffalo pea has fleshy pods, which are produced in enormous quantities in the early spring. They are eaten by cattle and horses, and are nutritious. The pods have also been used as a vegetable. Besides these innocuous species, the genus contains a number which have attained wide notoriety as loco weeds, poisonous to stock, the worst and most widely distributed one being *A. mollissimus*. Many of the species are worthy of cultivation.

Atriplex canescens. Shad scale. (Fig. 7.)

A perennial shrub of the Pigweed or Saltbush family, often attaining a height of 10 feet, native in the higher valleys and mesas or table-lands of New Mexico and Arizona. The leaves and small twigs are eaten by cattle, which grow fat upon them, but are said to give a bad taste to milk. It is the principal forage plant of a wide range of territory in the Southwest, and deserves to be more widely distributed and brought into cultivation, especially on saline or alkaline soils.

FIG. 7.—Shad scale (*Atriplex canescens*.)

Atriplex confertifolium. White sage; Shad scale.

A native saltbush, growing on the high plains of Nevada and Utah, where it furnishes a considerable part of the winter forage. It grows on alkali spots, and is worthy of cultivation in attempts to reclaim lands which are too strongly alkaline to produce better forage plants.

Atriplex leptocarpum. Slender-fruited saltbush; No. 2 Saltbush. (Fig. 6.)

An Australian saltbush, which is being introduced into this country for the same purposes as *A. semibaccatum*. It is a diffusely branching slender annual, and produces seed in enormous quantities. It will undoubtedly make a valuable addition to the forage plants adapted to the grazing regions of the West, and is reputed to withstand much drought.

Atriplex semibaccatum: Australian saltbush; Saltbush. (Fig. 8.)

A procumbent or prostrate much-branched slender perennial, with herbaceous stems spreading 1 to 4 feet in every direction. This species of Australian saltbush has become widely known within the last ten years, it being one of the best crops that can be grown for the reclamation of alkali land in California and the Southwest. It is a native of the Darling and Lachlan River valleys in New South Wales. Experiments conducted by the California Experiment Station have warranted the conclusion that the growth of the plant is vastly better on alkali soils than on ordinary dry soils. The saltbush takes up from the soil, when it is grown where there is an excess of alkalies, enormous quantities of these deleterious salts, so that the ashes often amount to one-fifth of the total weight of dry forage. The amount of crude protein in saltbush is nearly as great

as in alfalfa. It is an excellent forage plant for soiling sheep, though the nutritive ratio is such that it needs to be fed with hay or other coarse fodder in order to obtain the best results. Saltbush contains a bitter principle which acts as a tonic. It is probably the best plant for growing on alkali spots, especially if the crop is removed from the ground each year. Every ton of green forage so removed contains about 110 pounds of mineral ingredients, of which the soda salts form a very large percentage. Saltbush is not so well adapted to those portions of the West where the winters are severe, in such localities being an annual and requiring fresh seeding each season. The seed may be obtained at fair prices in the California markets.

Atriplex vesicarium. Bladder saltbush.

An Australian species, which Baron von Mueller considers one of the most valuable forage plants of that country, because of its abundance on the arid plains of the interior and the facility with which it disseminates itself. It withstands the utmost extremes of drought. It was introduced into Europe a number of years ago, and is now extensively planted throughout the delta of the Rhone, where it is of great value for sheep. It is a woody species, which is easily multiplied from both cuttings and seed.

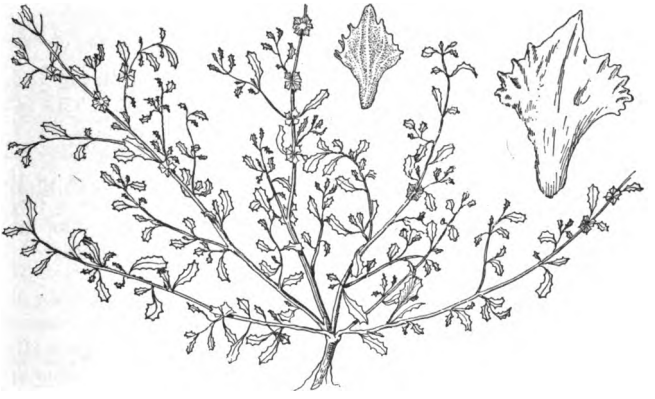

FIG. 8.—Australian saltbush (*Atriplex semibaccatum*).

Bœhmeria nivea. Ramie; Cloth plant; China grass plant; Ramie grass.

This well-known fiber plant, which has been introduced rather widely throughout the United States in the last twenty years, furnishes a large amount of forage of fair quality. It is eaten well by all kinds of stock; so that wherever this plant is grown for its fiber it is well to remember that it will also furnish valuble feed.

Brassica napus. Winter rape; Rape; Dwarf Essex rape.

A succulent and nutritious forage plant, closely related to the Swede turnips. It is adapted to deep, rich, and warm loams and sandy soils. It has been widely cultivated in the northern United States and Canada, and succeeds on any rich and well-drained soil, provided the summers are not too hot and dry. If the ground is in good condition and free from weeds, it may be sown broadcast at the rate of 3 to 5 pounds of seed per acre. If the land is wet, however, rape should be sown in raised drills, when 1 or 2 pounds will be sufficient. The time for sowing the seed will vary with the object sought, and the climate. For soiling purposes it may be sown in May in the States bordering on Canada, and cut or eaten off when it is sufficiently advanced. It will grow up again and may be used a second time in the same manner, but ordinarily the best results are obtained

when it is sown during the latter part of June or the first half of July. When put in earlier, the hot suns of August seem to hasten its maturity, and the yield is not satisfactory. If sown in drills, it should be cultivated as long as a horse can be driven between the rows. Sheep may be pastured upon a field of rape by cutting it up into small pens by means of movable hurdles, so that different parts of the field may be depastured in rotation. Cattle should not be turned into a field, because they will trample and destroy much more than they eat. Rape fed to cows increases the flow of milk, and there is less danger of the milk being tainted than when turnips or turnip tops are fed. There is considerable danger in turning hungry sheep or cattle into a field, because of a liability to bloat. It is also a good rule never to turn animals into a field in the early morning.

Brassica oleracea. Cabbage.

An annual or biennial plant, indigenous to various parts of Europe, and widely cultivated as a vegetable throughout the world. Cabbage is largely grown in some parts of Europe as a crop for soiling either sheep or cattle, and as a stable food in late autumn it is far superior to turnips. It has been estimated that the crude protein of an acre of cabbage amounts to about 1,500 pounds—an enormous yield compared with that of alfalfa or red clover.

FIG. 9.—Sedge (*Carex retrorsa*).

Carex aristata. Giant sedge.

A perennial sedge, with stout running rootstocks and leafy stems 2 to 3½ feet high. This is one of the most important forage plants of the Upper Missouri prairies, as it forms a large part of the growth in moist, boggy places in the regions where it occurs, and furnishes a large amount of early pasturage and hay. The hay contains over 11 per cent of crude protein.

Carex jamesii.

A sedge which is abundant in the moist meadows of northern Utah, where it occasionally occupies the ground to the exclusion of other species. It is pastured or mowed, and produces a poor quality of hay.

Carex muricata. Water grass.

A sedge, native of Arizona and New Mexico; very abundant in low places on the mesas. It contributes a large part of the hay cut from wet meadows, and is eaten well by stock.

Carex retrorsa. Late-fruited sedge. (Fig. 9.)

A stout, erect, tufted, leafy sedge, 1½ to 3 feet high, growing in wet, boggy places in the lake region of Minnesota and the Dakotas. It is very tender and juicy, and is readily eaten by stock. It is seldom cut for hay, because of its growing in places too wet to be mowed, but it is an important factor in the natural forage of the region. Analyses show that it contains nearly 16 per cent crude protein. This is one of the species which is deserving of cultivation.

Carex siccata. Silver-topped sedge.

A perennial sedge, spreading extensively by means of creeping rootstocks, with clustered erect stems 1 to 2 feet high, and erect, narrow, pointed leaves, shorter than the stems. Common on dry bottoms and in swales in the Upper Missouri prairie region. It may be distinguished by its silvery brown heads and by its habit of

forming extensive mats of turf. This is a very valuable species, as the hay contains nearly 15 per cent of crude protein.

Carex stenophylla. Dwarf sedge.

A low sedge, growing in moist prairies thoughout the Upper Mississippi and Missouri region. Analyses of this sedge show that it contains about 14 per cent of crude protein.

Carex straminea. Straw-colored sedge.

A perennial sedge, with erect, slender, clustered stems 1 to 3 feet high, and narrow stiff leaves, shorter than or as long as the stems. Common in the Mississippi Valley in dry prairies and moist meadows. It contributes a large amount of forage in the localities where common. The hay contains about 8 per cent of crude protein.

Carex stricta. Upright sedge.

A slender tufted perennial sedge, forming large bunches 6 inches to 3 feet high. The leaves are long and narrow, sharp pointed, and roughened on the margins. Common in low, wet meadows and along the margins of ponds and lakes throughout the prairie region. The hay contains 11 per cent of crude protein.

Carex sychnocephala. Narrow-fruited sedge.

A slender, erect, perennial sedge, growing in large tufts 6 to 18 inches high, with narrow, long-pointed leaves, longer than the stems, rare in boggy places along streams and lakes in the Upper Missouri prairie region. In localities where it occurs it adds considerable value to the early pastures. The hay contains 9 per cent of crude protein.

Carex vulpinoidea. Fox sedge.

A perennial sedge, common throughout the prairie region of the West, with stiff, sharply three-angled stems 1 to 2½ feet high, and flattish, long-pointed leaves, longer than the stems. It grows in large bunches, and prefers low prairies and rather dry swales. It is readily eaten by stock. Analyses show that hay of this species contains over 10 per cent crude protein.

Centrosema virginianum. Spurred butterfly pea.

A twining perennial bean, with trifoliate leaves and large, showy violet flowers an inch long. The pods are 4 to 5 inches long, many-seeded, linear, flat, thickened at the edges, and marked with a raised line on each side next the margin. Common in sandy woods in the Southern States, extending into tropical America. It furnishes a large amount of valuable forage in woodland pastures, and is worthy of cultivation.

Ceratonia siliqua. Carob tree; St. John's bread; Carob bean.

A leguminous tree, often attaining a height of 50 feet, indigenous to the eastern Mediterranean region, but introduced somewhat widely through the Southern States and in California. Its saccharine pods are very valuable as a food for stock, and are sometimes used as human food. The fruit is abundantly produced, even in arid regions and in seasons of drought. The pods contain about 66 per cent of sugar and gum, and are fed in rations of about 6 pounds per day, crushed or ground.

Chenopodium. Pigweed; Goosefoot; Lamb's-quarters. (Fig. 10.)

There are a large number of native and introduced species in the United States, all of which are eaten by cattle and sheep, contributing much valuable forage when young. They are adapted to arid and barren lands, as well as to cultivated fields, and should be included in the list of forage plants adapted to the grazing regions of the West.

Cicer arietinum. Chick pea; Ram's horn; Gram; Coffee pea. (Fig. 11.)

An annual legume, native of Armenia, which has been cultivated as cattle food and as an article of human diet for over three thousand years. Next to the cereals, it forms the largest part of the food used in Spain, India, and portions of Africa. The seeds are ground into meal, and used in the same manner as cotton-seed meal for fattening animals. The leaves are covered with a clammy exudation, consisting largely of oxalic acid, so that the plant itself is unsuited for forage, but it is often used as a soil renovator. The yield of seed is sometimes very large—upward of 100 bushels to the acre. The crop ripens in about four months.

FIG. 10.—Pigweed (*Chenopodium leptophyllum*).

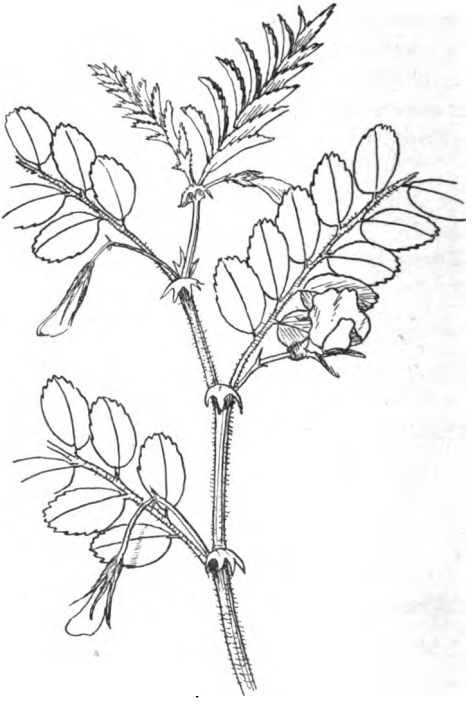

FIG. 11.—Gram (*Cicer arietinum*).

Cichorium endivium. Endive.

This culinary vegetable is particularly adapted as a pasture plant for extremely arid regions, as it matures seed which will germinate in the hottest deserts of central Australia. (Von Mueller.)

Cichorium intybus. Chicory.

A well-known perennial, indigenous to Europe and northern Asia, where it is found growing wild along roadsides and in old fields. It is a good fodder plant, especially for sheep, and can be kept growing for several years if it is cut before flowering. The roots are much used as a substitute for coffee.

Clitoria mariana. Butterfly pea.

A low ascending or twining legume with pinnately trifoliate leaves and pale-blue flowers 2 inches long. It grows on dry hills and banks of streams in the Eastern and Southern States. A nutritious forage plant for woodland pastures, but usually too scattering to be of much value.

Convolvulus edulis. Sweet potato.

The tubers are used in many parts of the Southern States as food for cattle, and the vines are cured on racks like cowpeas, and used for hay.

Crotalaria juncea. Sunn; Sunn hemp.

A fiber plant, indigenous to southern Asia. It is cultivated in India to feed milch cows, and is suited for cultivation in the warmest portions of the United States. In rich, friable soil, under favorable circumstances, it often grows to a height of 10 feet.

Cyperus erythrorhizos. Chestnut-colored sedge.

An annual sedge with upright stems from 6 inches to 2½ feet high, leafy at the base, and with four or five leaves clustered about the inflorescence at the top. The flower clusters are usually bright chestnut-brown. Widely distributed over the prairie region, where it grows in rich, moist meadows. The hay contains over 10 per cent of crude protein, and while this sedge is not abundant, it adds no little value to native pastures and wet meadows.

Cyperus esculentus. Chufas; Hognut; Ground almond. (Fig. 12.)

A perennial sedge, spreading extensively by underground stolons, which produce enormous numbers of edible tubers. In rich, sandy loams it is often cultivated as a food for hogs, which are turned into the field in autumn to root up the nuts. The tubers contain from 17 to 28 per cent of oil, 27 to 29 per cent of starch, and 12 to 21 per cent of gum and sugar. This sedge is important for cultivation in desert regions. The oil extracted from the nuts is said to surpass in excellence all other oils used for culinary purposes.

FIG. 12.—Chufas (*Cyperus esculentus*).

Cyperus strigosus. Tule; Tula grass.

A tall sedge with the stems 4 to 6 feet high, growing in marshy places in California and Arizona. It is much relished when young by all kinds of stock.

Cytisus proliferus albus. Tagasaste.

A shrubby perennial legume with silvery gray leaves, native of the Canary Islands, which has been recommended for cultivation as a forage plant in hot and dry regions. It will perhaps prove of some value in the arid Southwest. The seeds, which are slow in germination, should be boiled four or five minutes, or soaked in water for twenty-four hours before planting. The plants should be kept one year in the seed bed and then transplanted to rows 6 to 8 feet apart in the field where they are to remain, and cultivated until they are 2 or 3 feet high. At the end of about the third year cattle or sheep may be turned into the field, and the crop will require no further attention except to occasionally cut back the shrubs to prevent their growing too high. The leaves and twigs are very nutritious, both cattle and sheep fattening rapidly upon them. This plant should be given a thorough trial in the southwestern portions of the United States, for when once firmly established the tagasaste plants will withstand any amount of drought.

Dalea scoparia. (Fig. 13.)

A wild vetch, with gray, almost leafless, stems; abundant on the mesas of New Mexico and Arizona, where it furnishes almost the only forage in the dry season. It is worthy of cultivation.

Dasylirion texanum. Sotol.

A fodder plant of the lily family, which occurs throughout western Texas and northern Mexico. It grows abundantly in the great bend of the Rio Grande, and is there highly esteemed, producing fodder for sheep in the winter season and during periods of extreme drought. The appearance of the plant is something like

FIG. 13.—*Dalea scoparia.*

FIG. 14.—Beggar weed (*Desmodium tortuosum*).

that of a large pineapple growing on a trunk 2 to 5 feet high. The narrow leaves, 3 to 4 feet long, and one-third to one-half inch wide, radiate in every direction, forming a rosette at the top of the trunk. The portion eaten is the inner cabbage-like heart, which remains after the spiny leaves have been cut off. An analysis of this, made by the chemist of the Department of Agriculture, shows that it contains about 12 per cent of sugar and gum, and about 3 per cent of crude protein, besides 65 per cent of water. No attempt has been made to cultivate sotol, and it is becoming exterminated in many portions of its range. Sheep can exist upon it four or five months in the winter without access to water, so that it would be an excellent forage plant for dissemination and cultivation in arid regions where the winters are not too severe.

Desmanthus brachylobus.

An erect perennial legume 1 to 4 feet high, with twice pinnate leaves, and sickle-shaped pods 1 inch long, borne in a dense globular cluster. Common on bottom lands and alluvial banks from Minnesota to Kentucky, Florida, and Texas. It is much relished by horses and other stock, and should be given a trial in cultivation.

Desmodium acuminatum.

A valuable forage plant, growing in rich woods from Canada to the Gulf. The leaves are crowded at the summit of the stem, from which arises the elongated naked raceme.

Desmodium canadense.

A tick trefoil with hairy stems 3 to 6 feet high, and oblong lanceolate, obtuse leaflets longer than the petiole. In rich, dry woods from New Brunswick to Minnesota and Kansas. A species deserving of trial under cultivation.

Desmodium nudiflorum.

Common in dry woods throughout the Eastern and Southern States. The leaves are all crowded at the summit of the sterile stems, the elongated raceme springing directly from the roots. This tick trefoil furnishes considerable forage in woodland pastures.

Desmodium pauciflorum.

A perennial woodland tick trefoil with leaves scattered along the low ascending stems, 8 to 15 inches high, the inflorescence few-flowered and terminal. Common in woods from Canada to Kansas and southward, and valuable as a forage plant for shady pastures.

Desmodium tortuosum (*D. molle*). Beggar weed; Florida beggar weed; Cockshead; Florida clover; Tick trefoil; West Indian honeysuckle. (Fig. 14.)

An annual leguminous plant, indigenous to Florida and the Gulf States, extending into the West Indies and tropical America. This is undoubtedly one of the very best forage plants for those portions of the United States where it grows. The stems are tall, and, if grown at considerable intervals, are woody, but where seed is scattered thickly over the ground the entire plant can be converted into hay or ensilage. Florida beggar weed springs up naturally in fields wherever the ground has been disturbed, about the middle of June, and matures a crop in seventy-two to eighty days. On sterile clay soils in the vicinity of Washington, D. C., beggar weed grows 3 to 4 feet high. In the rich, moist, sandy fields along the Gulf of Mexico it grows from 6 to 10 feet high. Horses, cattle, and mules are very fond of it. Beggar-weed hay contains about 21 per cent of crude protein. At a yield of 10 tons, the amount of fertilizers contained in a crop yielded by one acre has been estimated at: Potash, 80 pounds; phosphoric acid, 160 pounds, and ammonia, 400 pounds. It will be seen from this that as a renovator of worn soils, or as a green manure, no better or cheaper fertilizer can be added to a field than to turn under a rank growth of beggar weed. The tap root descends deeply into the soil, bringing up mineral fertilizers from the subsoil, which can be utilized by other crops. Beggar weed can be sown after a crop of oats has been harvested, or it can be scattered between corn rows after the crop has been laid by. Six to ten pounds of clean seed are enough for an acre. If beggar weed is tried as a crop in the North, it should not be planted until midsummer. If planted early, the seed will lie in the ground and will fail to germinate until the ground has become warm. Clean seed can be procured in the markets at about $15 per bushel of 60 pounds. Beggar weed makes an excellent quality of ensilage, either alone or mixed with corn fodder.

Desmodium triflorum.

A densely matted perennial herb, occurring in tropical regions of Asia, Africa, and America. Roxburgh states that it helps to form the most beautiful turf in India, and that cattle are very fond of it. It springs up in all soils and situations, furnishing an excellent fodder in places too hot for ordinary clover. It deserves

trial in the warmest portions of the Southern States. There are many other species of Desmodium in the eastern and southern United States, some occurring in woodlands, and others found only in open prairies. All are eaten with avidity by stock, and all are worthy of an extended trial in cultivation, although on account of their jointed pods covered with minute hooked hairs they are perhaps liable to become weeds. The foliage produced by them is exceedingly nutritious, and because they are strong growers they would have some value in reclaiming worn lands.

Dioscorea batatas. Chinese yam; Yam.

A rank-growing vine cultivated in all tropical countries for its edible roots. It is propagated by means of aerial tubers which form in the axils of the leaves. This has been introduced into tropical Florida. The fleshy, mucilaginous roots serve as food for man, and are readily eaten by all kinds of stock.

Dolichos multiflorus. Velvet bean; Banana field pea; Banana stock pea.

A rank-growing vine with plump, velvety pods, each containing 3 or 4 large oval beans. An ornamental, which promises to become a valuable forage plant on sterile, sandy soils in the South. In Florida it has yielded at the rate of 16,680 pounds of green forage per acre. It is there esteemed as a winter mulch, as, when killed by frost, the leaves remain on the vines over winter.

Eleocharis obtusa. Tufted spike rush.

A tufted annual spike rush with leafless stems 8 to 18 inches high. It grows in shallow ponds and marshes in the Upper Missouri prairie region, and furnishes a fair quality of forage in localities too wet for grasses and sedges. The hay contains 10 per cent crude protein.

Eleocharis palustris. Common spike rush.

A spike rush with slender, cylindrical, upright tufted stems, 1 to 4 feet high, from perennial roots and running rootstocks. Very common in shallow water or in wet meadows from Lake Champlain along the Great Lakes to Minnesota and northward. The leafless stems yield a considerable amount of early pasturage in wet meadows. The hay contains 9½ per cent of crude protein.

Erigeron canadensis. Horseweed; Butterweed; Fireweed.

A bristly, hairy, erect, wand-like, annual composite, with numerous linear, mostly entire, leaves, and very numerous heads of small, dirty white flowers. A cosmopolitan weed growing in waste lands, fence corners, and along roadsides. This species has been reported valuable as sheep fodder in the arid regions of New Mexico and Arizona.

Erodium cicutarium. Alfilaria; Storksbill; Pin clover; Pin grass; Pinweed; Filaria; Filaree; Alfilarilla. (Fig. 15.)

This weedy annual has nearly as large a distribution as the following species, but is of less value. This species has been regarded by agricultural writers as the true *Alfilaria*, but according to Professor Greene its occurrence is rare compared with that of *E. moschatum*, and its foliage is more fragrant and less readily eaten by stock.

Erodium moschatum. Cranesbill; Alfilaria, Storksbill; Pin clover; Pin grass; Pinweed; Filaria; Filaree; Alfilarilla.

An annual of the Geranium family which occurs abundantly, and is of much value in pastures over a large extent of territory on the Pacific Slope. Elsewhere in the United States it is sparingly introduced, and usually regarded only as a weed,

though not troublesome. It springs up during the wet season from January to June, and grows on all kinds of soils from the coast up to the snow line. It is an excellent pasture plant, but seldom reaches a sufficient height to be mowed for hay. It is eaten by all kinds of stock as long as it is green, but when dry is of little value because the stems are brittle and break up into small fragments. It is cultivated to some extent, and has been recommended for sowing in pasture lands in the Southern States. A related species, *E. cygnorum*, native of Australia, is considered one of the best forage plants of the drier regions of that continent.

Ervum lens. Lentil; Winter lentil.

An annual legume, native to and widely cultivated in Europe. The leafy stalks make good forage. Its seeds are palatable and nutritious as food for man and

FIG. 15.—Alfilarilla (*Erodium cicutarium*).

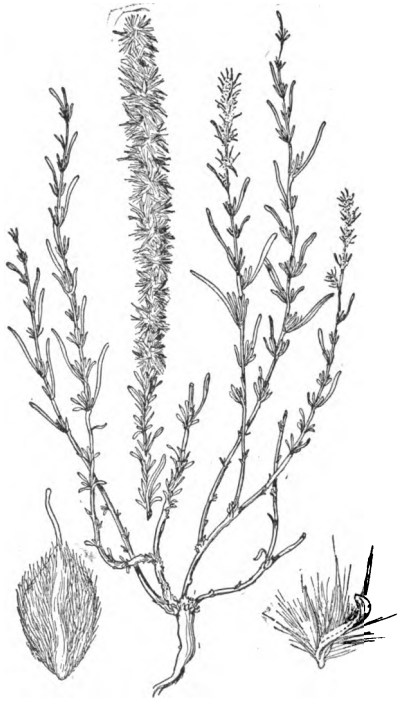

FIG. 16.—Winter fat or sweet sage (*Eurotia lanata*).

domestic animals. It is suited for cultivation in cold climates and in the mountains at high elevations. The seeds retain their vitality for about four years. The variety called the "winter lentil" is more prolific than the "summer lentil." In common with most other leguminous plants, a calcareous soil is essential for its prolific growth.

Eurotia lanata. Winter fat; White sage; Sweet sage. (Fig. 16.)

A perennial half-shrubby plant growing a foot or two high, abundant throughout the Rocky Mountain region from British Columbia to Mexico. Its slender woolly twigs bear narrow leaves an inch and a half long, with velvety grayish surfaces, and with the margins rolled back. The flowers are minute, in small clusters in the axils of the leaves, chiefly on the upper parts of the stem. In western Texas and in the more arid regions of Arizona, Nevada, and Utah this

plant is very highly valued for winter forage. An important fact in regard to the plant is its ability to thrive in alkali soils. It contains a bitter principle, which is sometimes employed as a remedy for intermittent fevers. Sheep and cattle grazed on lands where winter fat grows, increase in weight rapidly, and are said to be remarkably free from disease. It is worthy of trial, and should be introduced into the pastures of all arid and semi-arid or alkaline grazing regions.

Faba vulgaris. Horse bean; Broad bean; Common field bean; Straight bean.

A coarse, erect, rank-growing annual of considerable value as a forage plant, grown in the eastern United States, and more extensively in Europe. The beans, which contain about 33 per cent of starch, are used for fattening cattle, but their use, if long continued without change or without proper admixture of other foods, often results in paralysis, on account of the bitter poisonous alkaloids which the seeds contain.

Fagopyrum esculentum. Buckwheat; Common buckwheat; Japanese buckwheat; Silver-hull buckwheat.

Buckwheat, the well-known annual cultivated for its seeds, is a native of northern Asia, and has been under cultivation about 1,000 years. It succeeds in cold climates on the poorest land. For fodder or as green manure, clayey soils produce the largest crops. On account of the short season in which it matures, it is adapted to cultivation in high latitudes and alpine regions. It is an excellent soiling crop, either fed alone or with oats or green corn, and is recommended for soiling milch cows.

Franseria dumosa.

A shrubby plant related to the cocklebur, which is one of the most characteristic plants of the Colorado desert and the dry sandy plains of southern California. It is valuable feed for stock, either dry or green. It produces an abundance of burs, which are eaten by cattle and horses, and are as fattening as grain. It also makes a very fine feed for sheep. It dries up after the winter rains, but becomes green after every shower.

Galactia glabella. Smooth milk pea.

A low, prostrate or twining, perennial bean with nearly smooth stems, trifoliate leaves, and purple flowers in interrupted or nodding racemes. Common in sandy woods from New York to Florida and Mississippi. It makes an excellent summer forage for milch cows, and adds value to woodland pastures.

Galactia pilosa. Milk pea.

Like the last species, but with stems and leaves soft and downy. It is of some value as a summer forage in the eastern United States.

Galega officinalis. Goat's rue; Goat's clover.

A perennial legume, with erect, branching, leafy stems 1½ to 2 feet high, pinnate leaves, and purple flowers borne on a long-stalked spike. A forage plant of value on account of its resistance to drought, which has been recommended for the northern prairies and central Rocky Mountain districts. It is usually fed green, as it makes a poor quality of hay, and is not readily eaten by stock until they have become accustomed to its taste. The air-dried hay contains 17 per cent of crude protein.

Genista scoparia. Scotch broom.

A shrubby, perennial legume, native of Scotland. The young growth is chiefly valued as a food for sheep and other animals in winter.

Gleditschia triacanthos. Honey locust.

A leguminous tree 30 to 60 feet high, native of the eastern United States. The pods are eaten by stock, and the young growth is browsed down by cattle.

Glycine hispida. Soja bean; Soy bean; Coffee bean. (Fig. 17.)

An erect annual legume, with hairy stems and leaves, which has been cultivated in China and Japan from remote antiquity. It was long grown in botanic gardens, but when the facts concerning its use as a human food by oriental nations came to light about twenty years ago, it was largely introduced into this country and Europe, where thorough trials of its forage and food value have been made. There are a large number of named varieties, which vary in the color of their seeds and the length of time which the plants require to come to maturity. The seed is planted at the rate of half a bushel to the acre, in drills 2½ to 3 feet apart, and cultivated about the same as Indian corn. In Virginia, soja beans are planted between the hills of corn, so that two crops are produced on the same field at the same time. The yields of seed are often enormous. Soja beans are fed to stock green, as silage, or as hay. The haulms are rather woody, and

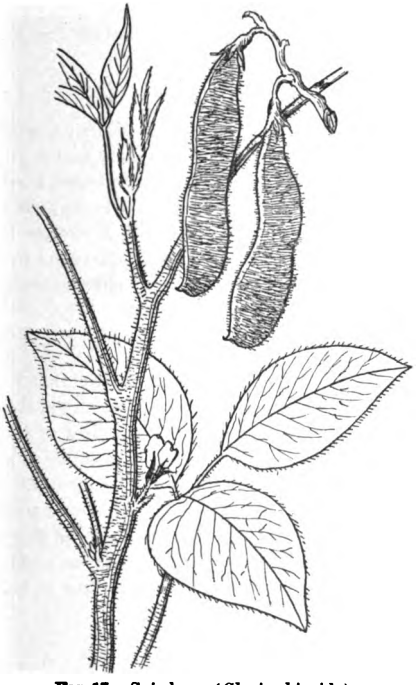

FIG. 17.—Soja bean (*Glycine hispida*).

FIG. 18.—Sulla (*Hedysarum coronarium*).

do not make the best quality of hay, but as either ensilage or green forage they are unsurpassed. The hay contains from 14 to 15 per cent crude protein and 3 to 6 per cent of fat. The beans contain from 32 to 42 per cent protein, and from 12 to 21 per cent of fat in fresh material. When fed to milch cows, a ration of soja beans increases the yield of milk, improves the quantity of the butter, and causes the animal to gain rapidly in weight. It is an excellent addition to a ration for fattening cattle. In China and Japan, where the soja bean is an article of diet, substances similar to butter, oil, and cheese, as well as a variety of dishes, are prepared from it. The yield of green forage amounts to from 6 to 8 tons per acre, and of the beans from 40 to 100 bushels. The feeding value of the bean has been found to be greater than that of any other known forage plant except the peanut.

Hedysarum coronarium. Sulla; Spanish sanfoin; French honeysuckle; Soola clover; Maltese clover; Honeysuckle. (Fig. 18.)

This perennial legume is a native of southern Italy, and was first introduced into cultivation in 1766. It grows best on sandy or clayey soils which are well

drained, or which have the ground water from 6 to 10 feet below the surface. It will withstand slight frosts, but is killed if the roots are frozen. It is a perennial in southern Italy, Sicily, and Algeria, but must be resown each year in northern Italy, where the winters are more severe. It has not as yet been largely introduced into this country, but deserves to be given a trial in Florida and the Gulf States. The practice is to sow the seeds in September or October, on land that has been deeply plowed and thoroughly pulverized, either alone or with winter oats or wheat. After the latter has been taken off the field, a crop of sulla 4 to 6 feet high springs up and is ready to cut from the latter part of May to July. In feeding value it compares very favorably with either red clover or alfalfa, and is better adapted to tropical or subtropical climates, provided seed is sown on well-drained and well-prepared land. If the seed bed is only given a shallow cultivation in preparation for sowing, it will require a full year before one crop can be taken from the land. The same precautions are necessary in using sulla as a soiling crop as with clover and alfalfa, to prevent loss of cattle through bloating.

Helianthus annuus. Sunflower.

The sunflower is a well-known annual weed, a native of Peru, which has become widely spread throughout the United States. Its leaves and heads make good green fodder for cattle and horses, and its oily seeds, which are produced at the rate of from 40 to 50 bushels to the acre, furnish an oil cake which is a valuable stable food. Six pounds are required to seed an acre. It is said to endure the excessive summer heat of central Australia better than any other cultivated herb that has been tried there, and deserves to be regarded as other than a useless weed in our own arid and semi-arid grazing and pastoral districts.

Helianthus tuberosus. Artichoke.

The artichoke is a native of North and South America, and has been cultivated in this country for fifty years or more for its edible tubers. Fed to milch cows, these tubers, which contain large amounts of sugar and gum, increase the flow of milk enormously. The leaves are also eaten by all kinds of stock. Artichokes are planted like potatoes, but greater distances apart, and the yield is from 200 to 500 bushels per acre. On rich and friable soils it yields spontaneously and uninterruptedly for several years without replanting. The tubers should be dug in autumn after the upper part of the plant has been killed by frosts, as at that time they contain the most sugar. It grows best in loams containing a high percentage of potash.

Hippocrepis comosa. Horse-shoe vetch.

This perennial fodder plant is quite widely cultivated in middle and southern Europe and northern Africa. It grows best on stony ground, especially on soils containing lime. It furnishes an early and very nutritious, though scant, forage, and is worthy of a trial on stony soils in the warmer portions of the United States.

Hoffmanseggia.

Leguminous shrubs or herbaceous perennials native of Texas and New Mexico, especially along the Rio Grande and its tributaries. The foliage is eaten by stock. Small, sweet tubers are produced by certain species, which in years of famine are eaten by the Mexicans and Indians.

Hosackia glabra. Deerweed.

This low bush or weedy herb grows on the mesas, and in the mountains and desert regions of southern California. It grows 2 or 3 feet high on the driest and most sterile soils, and is an excellent forage plant. It sometimes occurs in such abundance that it is cut for hay. As it ripens a large amount of seed each year, this is a promising species for trial under cultivation.

Hosackia purshiana (*Lotus americanus*). Wild vetch. (Fig. 19.)

An annual vetch widely distributed from Minnesota to Arkansas and west to the Pacific, in fields and open prairies. The erect branching stems are 6 to 18 inches high, the trifoliate leaves nearly sessile, smooth to silky haired, the flowers small, solitary, and inconspicuous, the pods narrow, flattened, six-seeded, and about an inch long. It is very common in the prairie region, especially along the Upper Missouri, and in some parts of California. It blooms all summer, and being readily eaten by all kinds of stock is on this account a valuable plant on the ranges, withstanding close pasturing and trampling, and reseeding itself freely, no matter how closely it may be eaten down. Cattle and sheep become

FIG. 19.—Wild vetch (*Hosackia purshiana*).

FIG. 20.—Black grass (*Juncus gerardi*).

"rolling fat" on pastures where this vetch abounds. It is one of the most promising native forage plants, and should be given an extended trial in cultivation, being particularly adapted to the drier soils.

Juncus gerardi. Black grass. (Fig. 20.)

A leafy rush with somewhat harsh, slightly flattened stems, 1 to 2 feet high, common in tidewater marshes along the Atlantic coast and extending westward through the region of the Great Lakes. It is the principal constituent of some of the marsh hay cut along the coast; it has a fair feeding value, and is important as a forage plant which will grow where better and more nutritious species can not.

Juncus nodosus. Big-headed bog rush.

A leafy, erect, smooth, stiff rush, 1 or 2 feet high, with very slender, creeping, tuber-bearing rootstocks. The leaves are slender and long-pointed. This rush is common in boggy places and wet meadows in the prairie region, and is of

some little value as early pasturage. Hay made of it contains 7 per cent crude protein. The plant becomes too coarse for forage during the summer months.

Juncus tenuis. Slender bog rush.

A slender, tufted, erect, wiry rush, 6 to 18 inches high, with leaves about 6 inches long. A common plant throughout the prairie region, occurring on the high prairies as well as on low ground. Though rather tough and wiry, it is readily eaten by stock. The amount of forage is small. Hay made of it contains about 7 per cent crude protein.

Lathyrus cicer. Winter flat pea.

A forage plant cultivated to some extent in Germany and Switzerland, and particularly valued because it becomes green earlier in spring than almost any other forage crop. The seeds are sown at the rate of 2 bushels to the acre. Its appearance is much like the more common flat pea. It reaches a height of 1 or 2 feet.

Lathyrus hirsutus. Winter vetch.

This vetch is one of the best that has been grown in the Southern States for winter forage. It is sown in September or October, so that it may germinate with the fall rains and become established before cold weather. It grows slowly until the ground freezes. By the first of January the roots are sufficiently developed so that the tops begin to grow rapidly, and by February the plants form a dense mat and continue to grow until hot weather. The plants bear grazing well, and stock of all kinds eat the dry hay. For the Gulf States this is one of the most valuable species of vetch for winter and early spring fodder. It reseeds itself freely. (Tracy.)

Lathyrus macrorhizos.

A native of western Asia which would be valuable for introduction into this country. It makes a good growth on the most barren woodlands, especially in mountain regions.

Lathyrus polymorphus. Everlasting pea.

A low pea, 6 to 12 inches high, with very large purple flowers, common on the prairies from Missouri and Nebraska westward. This furnishes considerable pasturage, and ought to be given a trial in cultivation.

Lathyrus pratensis. Meadow pea.

A prostrate perennial, native to and cultivated in the colder portions of Europe and Asia. The yield is quite large. It can be utilized for sheep pasturage, the bitter foliage not being relished by other stock. Suited for cultivation in alpine regions.

Lathyrus sativus. Bitter vetch.

A native of middle and southern Europe, which is adapted to cultivation in cold climates and alpine regions. The fodder is superior to that of vetches, but the yield is scant. In India it is grown as a winter crop, often on heavy, clayey soils which will grow no other legume. Great caution must be used in feeding the seeds of this plant, as they contain an alkaloid which is highly poisonous to domestic animals and to man. It has not been cultivated much in this country.

Lathyrus splendens. Pride of California.

This vine has been introduced into gardens because of its beautiful flowers. It grows wild in the mountains of southern California, and is said to be an excellent forage plant.

Lathyrus sylvestris wagneri. Flat pea. (Fig. 21.)

A perennial, native of eastern Europe and northern Asia, which has of recent years been highly recommended as a forage plant on account of its drought-resisting qualities. The plant looks much like the ornamental sweet pea, with many weak, leafy stems which interlace in great tangled masses. The handsome rose-colored flowers are borne in loose clusters, and are followed by pods not unlike those of the field pea. Analyses of the hay, made at the Michigan Station, showed 27 per cent crude protein. The growth of the plant at first is slow, and it is recommended to plant the seed in beds, from which they may be transplanted at the beginning of the second season to the place they are to occupy in the field. Several cuttings may be taken each season in favorable localities, and the average life of a field is from fifteen to twenty-five years. In this country the best results have been obtained with the flat pea in California, in the arid Southwest, and in the Southern States. The hay is relished by domestic stock of all kinds, and on account of its highly nutritious character it is of much value for soiling purposes. It is of especial importance as a forage plant for arid regions, provided the lands can be irrigated. When once fully established it holds the ground for many years. Its root system is somewhat similar to that

FIG. 21.—Flat pea (*Lathyrus sylvestris wagneri*).

of alfalfa, inasmuch as it will not thrive on lands which are undrained, or where the ground water stands within less than 10 or 15 feet from the surface. When once its roots have penetrated into the subsoil, the plant will withstand the hottest and driest summer. On rich soil the growth is often 4 or 5 feet high.

Lavatera assurgentifolia.

A shrubby, branching mallow 6 to 15 feet high, with hairy stems, long-stalked five to seven angled leaves 3 to 6 inches wide, and large rose-red and crimson flowers on long curving flower stalks which bend downward. A native of the islands off the coast of southern California which has long been cultivated as a forage plant around San Francisco. It has become established there on the sand dunes and along the seashore. The mucilaginous leaves are eaten by stock.

Lespedeza capitata. Round-headed bush clover.

A bush clover with rigid woolly stems, short leaf stalks, oblong leaflets which are smooth above and silky below, and flowers in rounded clusters. Common in dry

and sandy soil from New England to Florida and westward to the prairies. This is a good pasture plant, which deserves cultivation.

Lespedeza cyrtobotrya. Bush lespedeza; Japan bush clover.

A shrubby Japanese perennial fodder plant 6 to 10 feet high, which, although quite nutritious and containing about 16 per cent of crude protein, has not been considered worthy of further cultivation in the South. (Tracy.)

Lespedeza polystachya. Hairy bush clover.

An upright wand-like plant 2 to 4 feet high, growing on dry hills and barrens throughout the eastern United States, and valuable as a pasture plant.

Lespedeza procumbens. Creeping bush clover.

A slender trailing prostrate plant, common in dry, sandy soils throughout the eastern United States, and of some value as a pasture plant.

Lespedeza striata. Japan clover; Bush clover; Hoop-koop; King clover; Sherman's clover; King grass. (Fig. 22.)

An annual legume, native of China, which was accidentally introduced into South Carolina about thirty-five years ago, and has become naturalized throughout the Southern States as far west as Texas. Because of its many good qualities, it is the most highly esteemed of all forage plants for this region. It will grow on worn fields and sterile or exhausted soils, spreading rapidly over the surface, preventing further washing of the land. In such localities it grows prostrate on the surface, forming a dense mat of turf. In rich soils, especially such as are calcareous, it grows 20 or 30 inches high, and when mown, makes an excellent quality of hay, greedily eaten by all kinds of stock. It is distinctively a summer forage, appearing about the first of June, and dying down at the first touch of frost. In sandy soils it suffers greatly from hot weather. The acreage of meadow and pasture lands devoted to this clover is increasing rapidly. Its roots penetrate deeply into the soil, and in common with most other leguminous plants, Japan clover, by means of the tubercles on its roots, collects nitrogen from the air, so that because of its ready and rapid growth it is one of the best crops to turn under as green manure, and is one of the best for use in renovating old fields. The feeding value is high, though less than that of clover and cowpeas. Seed should be sown broadcast at the rate of half a bushel to the acre, either in autumn with oats or winter rye, or alone in spring.

Lespedeza violacea. Violet clover; Purple bush clover.

A bush clover with upright or spreading branching stems, whitish downy leaflets, purple flowers, and ovate pods. Common in the eastern United States, and contributing a small amount of forage in woodland pastures. There are many other species of native American bush clovers, which are hardy and nutritious, and which occur in considerable quantity in woodland pastures and open prairies. They all contribute to the native wild forage, and deserve a thorough trial in cultivation.

Liatris. Blazing star; Button snakeroot.

The blazing stars, of which there are about a dozen species, scattered throughout the prairie region, contribute a small amount of palatable forage when young, but are probably not of sufficient account to recommend them for cultivation, except as an addition to sheep pastures in the semi-arid West and Southwest.

Lotus corniculatus. Birdsfoot trefoil; Birdsfoot clover; Yellow trefoil; Sweet trefoil; Horned clover; Cat-in-clover.

A low, prostrate clover that will grow on the lightest and most sterile soils. It is an Old World plant, with a wide distribution, and has become extensively natu-

ralized in this country, especially in the South. Cattle and sheep are fond of it, and because of its deep roots it withstands drought, so that it is an excellent clover to sow in mixtures with taller-growing species in dry pastures. It is particularly valuable in such places because the herbage has a salty taste and is welcome in hay.

Lotus tetragonolobus. Square pod pea. (Fig. 23.)

A much-branched ascending annual, closely related to the birdsfoot clover. It is a native of southern Europe, and is there grown for salads and as an ornamental plant. It has been recommended by the California Experiment Station as the best winter crop for plowing under in spring as green manure. It yields from 20 to 25 tons of green fodder, equivalent to 4 or 5 tons of air-dried hay, and the roots are described as being fairly incrusted with tubercles, whose office it is to extract nitrogen from the air; and though the plant does not contain as high a percentage

FIG. 22.—Japan clover (*Lespedeza striata*).

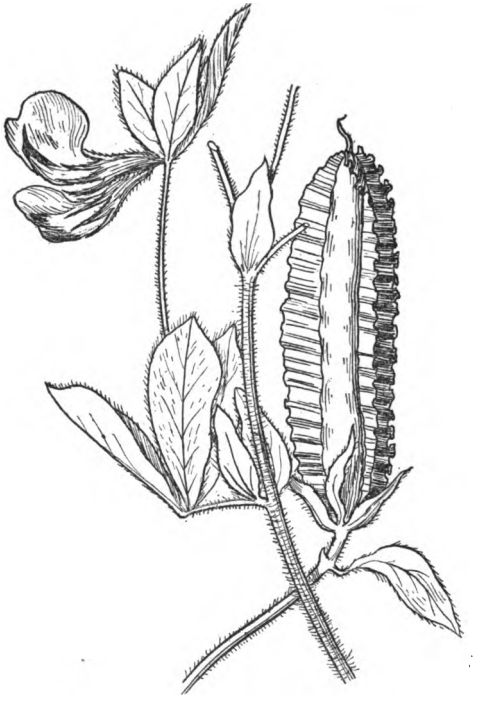

FIG. 23.—Square pod pea (*Lotus tetragonolobus*).

of crude protein as alfalfa or the clovers, it is worth as a green manure two or three times as much as either, because of the enormous amount of herbage produced. Sown in January, it will be ready to be plowed under in May. The seed should be sown broadcast thinly on freshly plowed land and harrowed in.

Lotus uliginosus. Swamp horn clover.

This is a slender branching clover, with heads of rather large yellow flowers, and slender elongated pods. It is a native of northern Europe, where it is esteemed for swampy meadow lands.

Lupinus albus. White lupine. (Fig. 24.)

An annual, native to the Mediterranean region, which is widely grown in Europe, and to a less extent in this country, for soiling and green manure. On rich soil it

grows from 2 to 3 feet high, and is recommended as a crop to plant for the purpose of enriching the ground, and at the same time freeing it from weeds. It has a deep taproot well supplied with tubercles, which gather large amounts of nitrogen from the air. It yields good forage while young, but should not be fed after the flowers appear. The seeds contain a bitter alkaloid. After this has been removed by soaking or boiling the seeds are sometimes used as food.

Lupinus hirsutus. Blue lupine.

The blue lupine is an annual, much resembling *L. albus* in value and habit of growth. Its only use is for turning under as green manure.

Lupinus luteus. Yellow lupine; Scented yellow lupine.

This annual species is the one most generally used in middle Europe to improve sandy soil, as the best of all yet tested. It is satisfactory even on sand dunes along the coast. Like the other lupines, it can be fed green or as hay. The

FIG. 24.—Lupine (*Lupinus albus*).

FIG. 25.—Tarweed (*Madia sativa*).

seeds of this species are very fattening when used as an addition to hay, and are in this respect quite equal to oil cake, while the foliage is said to be not inferior to that of clover, and more bulky. Ninety pounds of seed are required per acre. It should be sown in spring as soon as the ground is warm. It attains maturity very rapidly. Lupines, unlike most other leguminous plants, do not do well on calcareous soil nor on ground which is at all wet, but for improving sandy fields they have few equals. There are about 90 species of lupines native of the United States, principally in the Rocky Mountain and Pacific Coast regions, and many of them have acquired local reputation as being good pasture plants, particularly those that grow in the arid Southwest. One of our species, *L. perennis*, which is common to this country and the Old World, is often cultivated as an ornamental plant in gardens, and has been recommended by German agriculturists as equal in value to white lupine in certain dry soils.

Madia sativa. Tarweed. (Fig. 25.)

A rank-growing annual, native to both Chile and California, which has been recommended as furnishing an excellent summer sheep forage. The leaves are clammy with a viscid exudation, and the plant has a rank odor. Its chief merit is its rapid growth. It is cultivated in the arid Southwest and California, and makes a palatable and nutritious food for sheep. An excellent lubricating oil is extracted from the seeds.

Manihot aipi. Sweet cassava; Cassava. (Fig. 26.)

A spurge, native of the Tropics, largely cultivated in the West Indies, Central and South America, and to a less extent in Florida and California. It is a rapid grower, with rank, branching, erect stems 4 or 5 feet high, large, seven-parted, long-stalked leaves, and horizontal fleshy roots or tubers 3 to 5 feet long and from 1 to 2½ inches in diameter. It thrives in loose, dry, sandy loams, and produces from 6,000 to 8,000 pounds of roots per acre on soils of average fertility, to 10,000 or 20,000 pounds on fields that have received a large amount of fertilizers. The roots are fed whole or sliced to all kinds of stock. They contain 72 per cent of starch, 17 per cent sugar and gum, and over 3 per cent of albuminoids. On account of the small amount of flesh formers contained in the roots, they should be fed with some nitrogenous food to make up the deficiency. Cassava is propagated by means of cuttings of the stems, each piece having two or three eyes or buds. These are planted in hills 4 feet apart each way, and the rows rolled, to pack the earth around the cuttings and prevent their drying out. The roots should be dug only as fast as they can be used, as they rot very quickly when exposed to the air.

FIG. 26.—Cassava (*Manihot aipi*).

Medicago denticulata. Bur clover; Medick clover; Medick bur; Toothed medick. (Fig. 27.)

An annual clover, native of the Mediterranean region, which has become naturalized in most warm countries. It was early introduced into California, and has become widely distributed in that State and in the grazing regions of the Southwest. It is not as nutritious nor as palatable as either alfalfa or clover, but fills in the season when other more important forage plants have become dried up by the summer heat. Stock of all kinds fatten upon the burs, which they pick from the plant while it is growing, and search for on the ground after the foliage has become completely dry and dead. It flourishes best in moist valleys and along the coast where there is abundant rain, from January to June. It also occurs

on the drier uplands back from the coast, but does not do so well in such localities. One of its disadvantages is that its prickly burs become entangled in the wool of sheep. It has become widely disseminated over the ranges, and adds much to the value of the summer pasturage. To establish a crop of this clover, the burs may be scattered broadcast in autumn. They will root as soon as the winter rains come. They may be harrowed or cultivated in in the early spring.

Medicago falcata. Yellow lucern; Yellow moon trefoil.

A close relative of alfalfa, much resembling it, but smaller, and with yellow flowers. It grows wild in northern Europe, along roadsides and fence corners, and in light or sterile soils. It has been cultivated to some extent, but is without value, except that it furnishes a scanty pasturage on soils too barren for better and ranker growing species. It is even more susceptible than alfalfa to excess of water in the soil.

FIG. 27.—Bur clover (*Medicago denticulata*).

FIG. 28.—Black medick (*Medicago lupulina*).

Medicago lupulina. Black medick; Hop clover, in part; Yellow clover, in part; Nonesuch; Black nonesuch; Black grass; Shamrock, in part; Lupuline. (Fig. 28.)

An annual or biennial clover, widely grown as a pasture plant in wet meadows and on stiff, clayey soils which are too poor to grow alfalfa or clover. On rich, moist soil it sometimes makes an enormous growth, but ordinarily its only use is in pastures. It is sometimes recommended to be sown mixed with white clover for lawns, as it remains green through the driest summers.

Medicago maculata. Spotted medick; Bur clover; California clover; Black medick; Heart clover; St. Mawe's clover; Arabian snail clover.

An Old World pasture plant, which has become widely introduced in the Eastern and Southern States, as far west as Texas. It is very similar to *M. denticulata* in appearance and in its feeding qualities, and is often mistaken for the latter.

Both species occur in the South, and both are called bur clover. Spotted medick makes a ranker growth than the California plant, often in rich soil attaining a height of 3 or 4 feet, when it is sometimes mowed, making a poor quality of hay. Its principal value is in pastures. Its burs are fattening when once stock have acquired a taste for them.

Medicago sativa. Alfalfa; Lucern; French lucern; French clover, in part; Lucern clover; Lucern medicago; Alfalfa clover; Chilean clover; Brazilian clover; Spanish trefoil; Purple medick; Manured medick; Cultivated medicago; Medick. (Fig. 29.)

Alfalfa is one of the best known and most extensively grown forage plants throughout the entire United States, with the exception of New England. It is the best hay and soiling crop in the West, and is being rapidly introduced into the Southern and Eastern States. It is an upright, branching, smooth perennial, 1 to 3 feet high, with three-parted leaves, each leaflet being broadest above the middle. The purple pea-like flowers, instead of being in a head, as in red clover, are in long, loose clusters or racemes, scattered over the entire plant. The ripe pods are spirally twisted, and each contains several seeds. Alfalfa is a deep feeder. The taproot descends to a great depth wherever the soil is loose and permeable, often averaging 10 to 15 feet, while extraordinary depths of 50 or 60 feet have been recorded. It will grow in favorable soil anywhere from sea level up to 7,000 feet elevation, and the success or failure of the crop depends as much upon the character of the subsoil as upon the surface layers. Good drainage is necessary, as the plants are killed by excess of water in the soil or on the surface. Water must never be allowed to stand on a field for more than 48 hours at a time. It feeds most heavily on lime, potash, magnesium, and phosphoric acid, yielding better and uniformly heavier crops on the rich prairies west of the Missouri River, which contain a greater percentage of these mineral ingredients than the older cultivated lands of the East. If the subsoil is heavy and stiff and impervious to water, alfalfa will never be a permanent success, no matter how well the surface soil may be prepared. Thorough preparation of the seed bed is the first essential. Plow deeply and subsoil deeply, and before planting the seed, work the field until it is in perfect tilth. Seed should be sown broadcast in amounts of from 15 to 25 pounds per acre, according as to whether a seed crop or a hay crop is desired, as soon as the ground is warm and there is no further danger from frost. Cover the seed very lightly. If sown broadcast, a light harrow or brush would be sufficient; or, if there is rain immediately after

FIG. 29.—Alfalfa: *a*, *b*, seed pod; *c*, seed.

sowing, no harrowing will be necessary. The field selected should be free from weeds, and the alfalfa should be sown without any nurse crop, as the young plants are very tender, and are easily choked out by a nurse crop or a rank growth of weeds. A crop may be cut as soon as it has attained the height of 12 to 15 inches. The second and following crops should be cut when the plant is coming into bloom, as at that period it contains the highest amount of digestible food. A heavier yield may be obtained by waiting, as many do, until the pods commence to form, but the stalks are then woody and less palatable, and there will be more waste in feeding than if it had been cut when in early bloom. Considerable care is necessary in curing, to prevent heating, and especially to prevent the loss of leaves. The best practice is to cure in haycocks. Stacks of alfalfa will not turn water unless they are topped off with marsh or prairie hay, or covered with hay caps. The feeding value of alfalfa is very high, provided the crop is cut in due season; at the time of the first flowering, the crude protein amounts to about 18 per cent, and decreases to 10 or 11 per cent about the time ripe seed is formed. To be used economically, alfalfa hay should be fed with prairie or timothy hay, millet, corn fodder, or some other forage rich in carbohydrates. When cut in time, and properly cured, alfalfa hay is an exceedingly valuable item in the farm economy. Wherever the soil and climate are adapted to it, a field of alfalfa should be on every man's farm.

FIG. 30.—Snail clover (*Medicago turbinata*).

Medicago tuberculata.

An annual herb which, according to Baron von Mueller, is valuable for pasture lands, as its fruits, although somewhat rough, never become spiny, and do not injure the fleeces of sheep.

Medicago turbinata. Snail clover. (Fig. 30.)

This resembles *M. tuberculata*, and has been recommended by the California Experiment Station for the same purpose. Its pods are liable to become spiny when the plant is grown in rich soil (Von Mueller). It is an excellent winter forage plant in California, the yield of tops and burs being larger than with the ordinary bur clover.

Melilotus alba. Sweet clover; Bokhara clover; Large white clover; Tree clover; Cabul clover.

This is a weedy biennial, concerning which extravagant claims have been made. It is chiefly valuable in the Southern States for early pasturage and for green manure. The long tap roots descend deeply into the soil, and when the crop is turned under, a very large amount of available plant food is left for the benefit of succeeding crops. Because of its strong odor, stock will not eat it until they have acquired the taste, but if they are turned into a field of sweet clover in early spring, before the other clovers have commenced to come up, they will quickly learn to eat it. The seed should be sown alone in August, or in February, at the rate of half a bushel to the acre. If sown in spring, a crop may be cut in autumn, and two or three crops the second season. It must never be allowed to go to seed.

Melilotus officinalis. Yellow sweet clover; King's clover; Hart's clover; Plaster clover; Melilot clover; Common melilot; Wild laburnum.

This European species has become quite widely naturalized in this country. It possesses little value—not enough to warrant its cultivation. It grows in swamps and in wet meadows, while *M. altissimus* grows only on the driest soils.

Modiola decumbens. Modiola.

A prostrate, creeping, weedy, annual mallow, native of Chile, which has been introduced into portions of California, and is recommended by the California Experiment Station as an alkali plant. Analyses made of it show that it contains almost as much crude protein as alfalfa. Sheep and cattle are fond of it, and eat it down closely. Because it roots freely at the joints, it is, like purslane,

FIG. 31.—*Modiola multifida.*

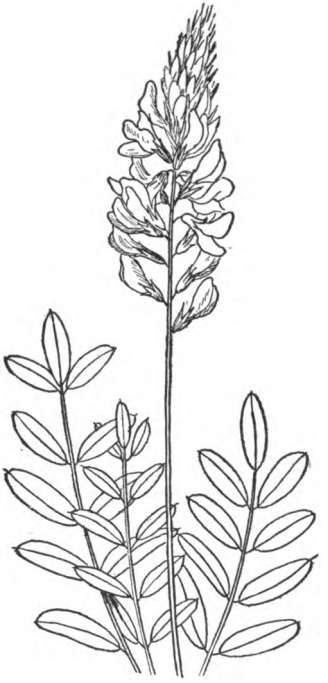

FIG. 32.—Sainfoin (*Onobrychis sativa*).

difficult to eradicate, and should be introduced with some caution. A closely related species of very similar habit, *M. multifida* (fig. 31), is a native of low grounds from Virginia southward. This is also valuable as a pasture plant.

Onobrychis sativa. Sainfoin; Esparcette; Asparset; Bourgoyne. (Fig. 32.)

A deep-rooting perennial legume, extensively cultivated in the temperate portions of Europe on dry, calcareous soils which are too barren for clover or alfalfa. The stems are erect or ascending, 1 to 2 feet high, ribbed and downy, the leaves unequally pinnate, composed of 6 to 12 pairs of opposite leaflets, with an odd terminal one. The bright pink flowers are numerous in spike-like racemes, borne on a long stalk. A permeable, well-drained subsoil is essential for its growth. Like alfalfa, it is quickly killed whenever the ground becomes saturated with water, and is therefore not suited for growth in wet meadows or in marshy lands. There is no better plant for growing on barren hills, but it

does better on the sunny slopes than on those facing north. It is rather difficult to establish, as the plants are easily killed when young, but when once well rooted, sainfoin will live from twenty to twenty-five or sometimes a hundred years, provided the soil is rich enough. One crop of hay can be cut each year. It should be cut at the time of full bloom, which in the latitude of Washington, D. C., is about the 1st of May. In England the average yield ranges from 1½ to 2½ tons per acre, and the hay is better and more nutritious than that of red clover. Eighty pounds of seed should be sown per acre, any time from the middle of May to the end of June, and, unlike alfalfa, it should be covered quite deeply to insure germination. If shelled seed is to be had, half as much will suffice. Fresh seed must always be used, as it loses its vitality if kept a year. It can be grown in any part of the United States, and should be more extensively cultivated, especially in localities where the ground is too dry or too barren for red clover. The yield of seed ranges from 10 to 25 bushels of 40 pounds. Sainfoin should not be pastured closely, as it does not have the same recuperative ability as the clovers.

Opuntia engelmanni. Nopal; Prickly pear. (Fig. 33.)

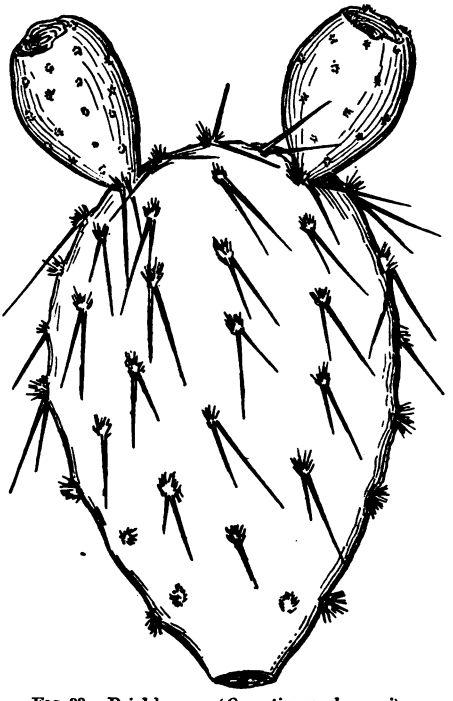

FIG. 33.—Prickly pear (*Opuntia engelmanni*).

A species of cactus which grows wild from western Texas through the arid regions of the Southwest to California. Its so-called leaves, or flat joints of the stem, are sometimes, in large specimens, a foot long and 9 or 10 inches broad. They are covered with groups of stout spines from one-half inch to 1½ inches long, which point backward on the stem. Throughout the grazing regions of Texas, where this prickly pear grows, it forms one of the most highly valued fodder plants. It is sometimes fed on the range, but the more common, most economical, and safest method of feeding is to prepare the stems by the removal of the spines. They are singed off by holding the joints a moment in a blaze, or the stems are chopped up in a feed cutter without removing the spines, or they are boiled to soften them. This cactus is chiefly utilized in dry seasons, when there is a shortage of grass on the ranges, the succulent stems containing a large amount of water, and enough starch and gum to sustain life. The best way is, however, to feed with hay or cotton-seed meal. Many thousand head of cattle are marketed every year which have been fattened entirely upon prickly pear and cotton seed. A ration of 5 to 7 pounds of the cotton seed and 50 to 60 pounds of prickly pear per head is one usually given. The stems vary from 1 to 6, or sometimes 10 to 12, feet high. They grow in such abundance, and are propagated so easily, that there is little danger of their ever being entirely exterminated. If fed alone, without proper admixture of other foods, prickly pear causes laxity, and when fed to working stock, a tendency to bloat.

Ornithopus sativus. Serradella. (Fig. 34.)

An annual legume, native of southern Europe and northern Africa, which is valuable as a fodder plant on moist and sandy sterile soils. At the Pennsylvania Station the yield from two cuttings was 11¼ tons of green forage. It does not require lime, and is often used as a green manure to bring up the value of sterile fields. The forage, which is much relished by cattle and sheep, has about the same feeding value as red clover.

Petalostemon. Prairie clover; White prairie clover; Purple prairie clover; Leafy prairie clover. (Fig. 35.)

A number of species of prairie clover are common throughout the prairie region and westward into the Rocky Mountains. They are erect perennial legumes, with

FIG. 34.—Serradella (*Ornithopus sativus*).

FIG. 35.—Prairie clover (*Petalostemon candidus*).

heads of white or purple flowers and finely divided compound leaves. They contribute a considerable amount of forage on the prairie pastures, and should be given a trial in cultivation.

Phaseolus diversifolius. Creeping kidney bean.

An annual, with prostrate spreading leafy stems, common on the prairies and cedar glades of the Southern States. The foliage is eaten by cattle and sheep.

Phaseolus helvolus. Long-stalked kidney bean.

A perennial bean with slender diffuse stems. A single plant makes a large quantity of herbage. Common in the Southern States, where, in certain localities, it produces a large amount of forage.

Phaseolus perennis. Wild kidney bean.

A species closely related to the garden bean, widely distributed over the eastern and southern United States, and as far west as the Mississippi River. It grows in woodland copses and along the banks of streams, and wherever found is eaten greedily by stock. It should be given a trial in cultivation.

Pisum arvense. Gray winter pea; Canada field pea; Field pea.

The common field pea is a native of Italy, and has been in cultivation for a good many hundred years. It is grown chiefly for its seeds, which are used both as an article of diet and for fattening cattle. It is one of the best soiling crops for milch cows, and is largely used in the Northern States and Canada and as far west as the Dakotas for this purpose, and for green manure. The seed is

FIG. 36.—Garden pea (*Pisum sativum*).

FIG. 37.—Knotweed (*Polygonum aviculare*).

sown broadcast and harrowed in. It is planted in early spring, and is ready to cut in May or June. For soiling, the fodder is sweet, palatable, and very nutritious. It also makes an excellent quality of ensilage. It grows best on light calcareous loams and produces heavy crops on rich land.

Pisum sativum. Garden pea. (Fig. 36.)

The garden pea, so generally cultivated as an early spring vegetable, is equally valuable as a fodder crop, but it requires richer land and is more quickly affected by drought than the field variety. Some botanists regard this as a cultural variety of the field pea.

Pithecolobium brevifolium. Huajillo.

A spiny leguminous shrub, indigenous to the lower Rio Grande. According to Dr. Havard, the permanent foliage is readily eaten by sheep and goats in the winter time.

Plantago lanceolata. Rib grass; Plantain; Ripple grass; Plantain herb; Rib herb.

A weed extensively naturalized in this country in lawns and meadows, and truly considered a vile pest, but in Europe frequently recommended for sowing in pasture mixtures. It possesses the advantage of growing on the most sterile soils. Cattle and sheep are fond of it when young. There are a number of American species, widely distributed in all parts of the country, many of which add value to the scanty spring forage in barren pastures. Some species of the prairie region grow on salt marshes and alkali spots, and would perhaps be of value for cultivation on such soils.

Polygonum aviculare. Knotweed; Duckweed; Dooryard grass. (Fig. 37.)

A weedy annual of the knotweed or smartweed family, common everywhere in dooryards, waste places, and fields. The stems are slender, prostrate or ascending, branching, 6 to 14 inches high, and leafy; the leaves oblong to lanceolate, from one-fourth of an inch to an inch long, pointed at each end, and bluish green. It is very hardy, growing readily on the poorest of ordinary soils, even in times of drought, and is greedily eaten by all kinds of stock. Stockmen in the Northwest esteem it highly, as it furnishes a palatable and nutritious forage, which continues green all summer under all kinds of hard treatment. The dry forage contains nearly 19 per cent of crude protein, so that its value as a flesh former is high, ranking above that of the clovers.

Polygonum erectum. Upright knotweed.

A hardy annual knotweed, widely distributed through the Northern States. In the upper prairie region it is highly valued as a forage plant for milch cows. It grows from 10 to 15 inches high, and in rich, moist soils may be cut for hay. The hay is nutritious, containing 11 per cent of crude protein.

Polygonum muhlenbergii. Knotweed; Smartweed.

This species has been very highly spoken of as a summer forage plant for wet meadows and marshy places. It is abundant throughout the United States, and is one of the species which would not become a weed if brought under cultivation. Cattle are very fond of it. There are numerous other species which, in the localities where they grow, add materially to the value of pasturage.

Polygonum sachalinense. Giant knotweed; Sachaline; Sacaline; Saghalin Polygonum.

Giant knotweed or sachaline is a hardy herbaceous perennial, 6 to 12 feet high, with strong creeping rootstocks, broad, somewhat heart-shaped, shining leaves nearly a foot long, and small greenish-white flowers appearing late in the season. It has been cultivated for a good many years as an ornamental. Recently attempts have been made to introduce it into this country as a forage plant, and extravagant claims have been made concerning it. Considering that it is a native of northern Asia, growing along moist river banks upon an island with a cold and very moist climate, and from the recommendations as to its culture by horticulturists who have had experience in growing the plant, it is very doubtful if it will prove a success except in swampy waste lands. The leaves are eaten by cattle, but the small quantity of forage produced and the time which one must wait until production commences, preclude its ever being of great value in this country.

Portulaca oleracea. Pusley; Purslane.

This well-known weed is of considerable value as an autumn forage plant in the South and Southwest. The fleshy leaves and stems are put forth in great abundance during the hottest and driest weather, and it is hard to kill. The same qualities which make it a vile pest in our gardens and cultivated fields

cause it to be highly esteemed by sheep herders and cattlemen in years of drought. Fed to cows it increases the flow of milk, but causes laxity if too much is given at once.

Potentilla. Cinquefoil; Five-finger.

There are a number of species of potentilla, native to the prairie regions west of the Missouri River. According to Professor Bessey, they contribute some value to the native pastures. They belong to the Rose family, and are closely related to the strawberry, which they resemble in foliage and habit of growth.

Poterium sanguisorba. Burnet; Burnet clover; Salad burnet. (Fig. 38.)

A so-called clover, belonging to the Rose family, the foliage of which resembles that of sainfoin. In the early part of the present century its cultivation was highly recommended, and extravagant claims were put forth concerning it, but it is

FIG. 38.—Burnet (*Poterium sanguisorba*).

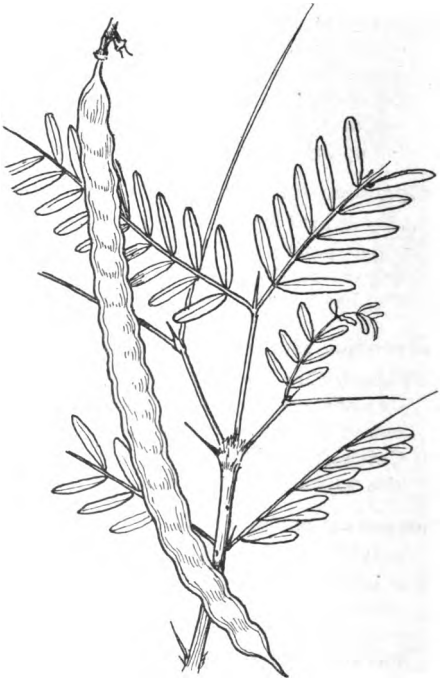

FIG. 39.—Mesquite (*Prosopis juliflora*).

now only used in mixtures for sheep pastures on dry and barren sandy or calcareous fields, such as are suited to the growth of sainfoin. The seeds of burnet are sometimes used to adulterate the latter, to which it is inferior in value, because of the smaller amount of forage which it produces. The dry hay contains about 15 per cent of crude protein.

Prosopis juliflora. Mesquite tree; Screw bean. (Fig. 39.)

A thorny, leguminous shrub, growing in favored localities to a tree from 20 to 40 feet high, with a trunk 2½ feet in diameter. It is widely distributed from Texas to southern California, through tropical America to Argentina. The leaves are very good browsing for horses and cattle. It bears two crops of beans a year, which are next to barley for fattening horses, cattle, sheep, and hogs. The leaves, pods, and bark are rich in tannin, and a gum, similar to gum arabic,

exudes copiously from the trunk and branches. The wood is hard, strong, and durable, and takes a high polish. It is the most common woody plant of the mesas of the Southwest, and because of its many uses is an exceedingly valuable species.

Prosopis pubescens. Tornillo; Screw bean.

A shrub or small tree similar to the mesquite, abundant along the Rio Grande and its tributaries. The pods are eaten by cattle. They are also used as food by the Mexicans and Indians. It may be distinguished from *P. juliflora* by its thick, spirally twisted pods, those of the former being straight or curved.

Psoralea esculenta. Pomme blanche; Pomme de prairies; Prairie turnip.

A perennial legume common throughout the prairie region. It produces edible tubers. Formerly used as food by the Indians and the voyageurs, and probably of some value as food for hogs.

Psoralea glandulosa. Jesuit's tea.

A trifoliate, bushy, leguminous shrub, native of Chile, which there grows in gullies and water courses which are dry in summer, and is eaten by cattle and horses. It is being introduced into similar regions in California as a forage plant.

Psoralea melilotoides.

This and other species occur on dry pasture lands in the Southern States, and are said to be good for all kinds of stock. There are about a dozen species native to the prairie region, which add value to both pasturage and hay. Because of their tough, slender roots they are commonly known as "shoe strings."

FIG. 40.—Mexican clover (*Richardsonia scabra*).

Richardsonia scabra. Mexican clover; Spanish clover; Ipecac weed; Florida clover; Water parsley; Bellfountain; Poor toe; Pigeon weed. (Fig. 40.)

An annual weed, native of Central America and Mexico, which has been introduced into the Southern States and has now spread along the Gulf westward into Texas. It is a succulent, creeping, prostrate plant, chiefly valued as a renovator of sandy fields on the coast. It is not a true clover, but belongs to the Rubiaceæ, the family in which coffee is included. Reports concerning it are conflicting. According to some it is a valuable pasture plant, while others affirm that neither cattle nor horses will eat it. On rich lands it can be cut, making a nutritious and palatable hay, which is readily eaten by all kinds of stock. Chemical analysis shows that the hay contains nearly as much nutriment as red clover. It is never cultivated, but appears as a weed after corn and cotton have been laid by. In Florida it is considered an excellent plant to grow in orange groves as a mulch, and to turn under for green manure.

Rubia tinctoria. Madder.

The foliage of this prickly dye plant makes forage of fair quality if cut the second season before the plants have commenced to blossom.

Salicornia herbacea. Saleratus weed; Samphire; Glasswort.

A low, fleshy, leafless herbaceous plant, growing in the borders of salt marshes from Arizona to the Saskatchewan and along the Atlantic coast. It grows on soils too salty or too alkaline to support any other plant. In portions of Arizona and in Utah it is valued highly for winter feed. After frost, stock live almost entirely upon it and "winter fat."

Sarcobatus vermicularis. Greasewood. (Fig. 41.)

An erect, scraggy shrub 2 to 8 feet high, with the leafy branches covered by smooth, white bark. It is one of the most common of the shrubs called "greasewood," in the region from Montana to New Mexico and Arizona, and where it is abun-

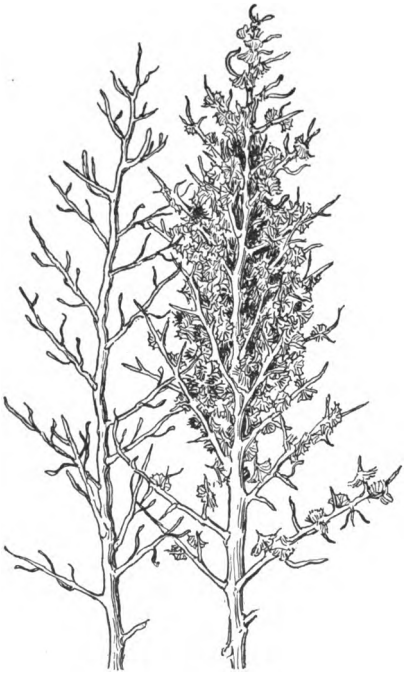

FIG. 41.—Greasewood (*Sarcobatus vermicularis*).

FIG. 42.—*Sida elliottii*.

dant, supplies a considerable part of the winter forage on the ranges. This and the saleratus weed belong to the Pigweed family, of which the Australian saltbush, so widely recommended for culture on alkaline soils, is a member.

Schrankia angustata and **S. uncinata.** Sensitive briar; Sensitive plant.

These herbaceous or shrubby legumes with prickly stems and sensitive leaves occur throughout the southern half of the prairie region. The foliage is eaten by stock and contributes some value to the native pastures.

Scirpus atrovirens. Meadow rush.

A sedge with rather stout, triangular stems 1½ to 3 feet high, and broad, smooth, bright-green leaves which become rigid with age. Widely distributed through

the upper prairie and lake regions in wet, boggy meadows. It is readily eaten by stock, although it does not occur in sufficient quantities to be of much value.

Scirpus fluviatilis. River club-rush.

A stout, erect perennial sedge, with sharply three-angled stems 3 to 5 feet high, and large, broad, flat leaves, which are smooth except on the midribs and margins, where they are more or less rough. It is common on the borders of lakes and large streams from New England west to the Dakotas and Iowa, and from its abundance is a valuable species, especially for early feed. In wet meadows it often contributes a large percentage of the feed. The hay contains 10 per cent of crude protein.

Scirpus hallii. Hall's rush.

A slender tufted sedge, 6 inches to a foot high, growing on the borders of ponds from Texas to South Dakota. It is readily eaten by stock. Hay of this species contains 10 per cent of crude protein.

Scirpus maritimus. Sea club-rush.

A perennial sedge with sharply three-angled, stout, erect stems, 1 to 3 feet high, and flat linear leaves as long as the stems. It is common in saline localities on the coast from Nova Scotia to Florida, and in the interior across the continent. It furnishes a large amount of coarse forage, and is often converted into hay of fair quality, because it can be cut early in the season before the grasses are in condition to mow. Hay made of it contains nearly 10 per cent of crude protein.

Sida elliottii. Elliott's sida. (Fig. 42.)

A low, shrubby or bushy plant of the Mallow family, native of the South, which grows 1½ to 2 feet high on hard, clayey soils and rocky land. It is an excellent pasture plant which readily catches from seed, provided the surface soil is scratched with a rake when the seed is scattered. Cattle, sheep, and hogs are fond of it, but horses and mules do not relish it. This sida has been quite widely introduced in the grazing regions of California. It apparently thrives better without than with irrigation, and is therefore of much value on waste lands designed for permanent pastures. It is not a good soiling crop, and should not be cut for hay.

Sida spinosa.

A weed of the Mallow family, which occurs in the Southern States. It has been recommended as a good crop for renewing worn lands, and makes very fair winter grazing for cattle.

Solidago. Golden rod.

There are a great number of species distributed throughout the United States. In New York and in other portions of the East where sheep are grown golden rod is highly esteemed as a fattening, healthful, and nutritious forage, though cattle and horses will not touch it.

Spergula arvensis. Spurrey; Sand spurrey.

An annual, producing a low, tangled mass of succulent stems with numerous whorled linear leaves. It produces a crop in eight or ten weeks, and is valuable as a catch crop in short seasons, and for soiling sheep and milch cows. It has been especially recommended as a first crop on the pine barrens of Michigan, to turn under for green manure. The air-dried hay contains about 12 per cent of crude protein.

Spergula maxima. Giant spurrey. (Fig. 43.)

Similar to common spurrey, but making a ranker growth. It is also slightly richer in flesh-forming ingredients, and is the more valuable species of the two.

Symphytum asperrimum. Prickly comfrey; Comfrey.

A coarse, rank-growing perennial herb, with purple flowers in nodding one-sided clusters, and large, rough leaves. A native of the Caucasus, which has been widely introduced and recommended as a forage plant for rich soils. It has been claimed that an enormous quantity of forage may be cut from an acre, but after extended trials in this country it has been determined to be of less value than the clovers, and is now rarely grown. It is propagated from the roots, which are set in rows 18 inches apart, and 16 inches in the rows. Its cultivation is not recommended, except when it is desired to procure an enormous bulk of forage from a small amount of very rich land. Prickly comfrey has proved a success only in New York, Michigan, and Florida, in the latter State having been recommended as a good forage plant for waste lands.

FIG. 43.—Giant spurrey (*Spergula maxima*).

FIG. 44.—*Thermopsis montana*.

Taraxacum dens leonis. Dandelion.

A weed, widely distributed over the United States, introduced from Europe in grain and grass seed. Its leaves furnish a scant but palatable and nutritious early forage in pastures for sheep, and the seed is therefore sometimes used as an ingredient of pasture mixtures.

Tetragonia expansa. New Zealand spinach.

An annual herb of the order Ficoideæ, native of the seacoasts of Chile, Japan, Australia, and New Zealand. Used as a vegetable, and also recommended as valuable in sheep pastures in arid regions and on alkaline or saline soils.

Thermopsis mollis. Downy leafed thermopsis.

A perennial legume with palmately trifoliate leaves and yellow flowers in terminal racemes. The stems are 2 to 3 feet high. A native of the mountains of southern Virginia and North Carolina, which is readily eaten by stock.

Thermopsis montana. (Fig. 44.)

A stout perennial herb with erect clustered stems 2 or 3 feet high, native of the Rocky Mountains. It is considered one of the best forage plants on the range, and makes a hay readily eaten by stock, if cut before the stems become woody. Another species, *T. rhombifolia*, grows in the eastern Rocky Mountains from Colorado northward. It is a good forage plant, though less abundant than the former species.

Tillandsia usneoides. Spanish moss; Long moss.

An epiphyte belonging to the Pineapple family, abundant in Florida and the Gulf States, where it is a characteristic feature of the forests with its long stems hanging in festoons from the tree trunks and branches. Cattle eat it, and it adds considerable value to the woodland pastures.

Tribulus maximus.

A loosely branched, hairy, prostrate herb, related to the creosote bush, occurring in dry soils in western Texas and the arid Southwest. It is eaten by sheep and cattle. It springs up all over the country when there is plenty of rain, and is highly valued by stockmen on the plains.

Trifolium agrarium. Golden clover; Yellow meadow trefoil; Yellow hop clover; Field clover; Hop clover; Yellow clover; Gold-colored clover; Large golden clover.

A perennial wild European clover, widely naturalized on sandy fields and by road sides in the Eastern States as far south as Virginia. It is of considerable value for sandy pastures.

FIG. 45.—Egyptian clover (*Trifolium alexandrinum*).

Trifolium alexandrinum. Egyptian clover; Alexandrine clover; Bersine clover. (Fig. 45.)

An erect, annual clover, native of Egypt, which in warm climates and upon rich soils makes an exceedingly rapid growth. Two or three heavy crops may be taken from a field in one season. Twenty pounds of seed are required for an acre. An excellent species for trial in the Southern States, wherever cane and cotton may be grown.

Trifolium alpinum. Alpine clover.

A European alpine species of little value in cultivation, although it has been recommended abroad as a forage plant for mountain meadows.

Trifolium amphianthum. (Fig. 46.)

A low, slender stoloniferous species occurring in Louisiana and Texas upon the most sterile soils. It spreads rapidly, and reseeds itself freely, producing a large amount of early spring pasturage. It comes into blossom about the middle of May. It is one of our most promising native wild clovers for cultivation.

Trifolium arvense. Rabbit foot clover; Haresfoot clover; Field clover; Field trifolium; Stone clover, in part; Welsh clover, in part; Hard clover; Hair clover, Hare clover; Hare's little paw; Mouse clover; Cat clover; Kitten plant; Pussywort; Gray clover; Lamb's tail.

A silky branching annual, 5 to 10 inches high, with soft, grayish oblong heads of flowers. Common in old fields and on barren lands in the eastern and southern United States. Of little value.

Trifolium badium. Brown clover (English); Chestnut-brown clover (German).

A clover, native of England and northern Europe, which has some slight value as a forage plant in pastures.

FIG. 46.—*Trifolium amphianthum.*

FIG. 47.—Alsike (*Trifolium hybridum*).

Trifolium beckwithii. Beckwith's clover.

A native of the eastern Rocky Mountain and Upper Missouri prairie regions. It has ascending stems 4 to 9 inches high, from strong perennial creeping rootstocks. It is very persistent, and endures all kinds of hard usage. Being much relished by stock, there is a possibility that it may prove of value as a cultivated forage plant. The dry hay contains nearly 14 per cent of crude protein. Beckwith's clover is highly valued by stockmen in the Northwest.

Trifolium carolinianum. Carolina clover.

A small, perennial, procumbent, tufted clover, widely disseminated in waste places from Pennsylvania to Florida and Texas. It furnishes a small amount of forage, especially in the southwestern extension of its range.

Trifolium filiforme. Suckling clover; Yellow suckling clover; Slender clover; Small-flowered clover; Thread clover; Slender-stalked clover; Little yellow hop clover; Golden clover.

Indigenous to northern Europe on sandy clay soils. A very nutritious forage in sheep pastures, it is often used in mixtures with grasses and clovers for wet, sandy meadows.

Trifolium fragiferum. Strawberry clover; Strawberry-headed trefoil; Bladder clover.

A wild clover, native of England and northern and central Europe, which much resembles white clover in appearance and nutritive qualities. It is a valuable species for cultivation in wet meadows.

Trifolium furcatum.

A rank-growing clover 2 to 3 feet high, native of the Pacific Coast. The flowers resemble those of common red clover, but are larger, sometimes 2 inches in diameter, and borne on long stalks. It is abundant throughout the coast ranges and affords good pasturage.

Trifolium hybridum. Alsike clover; Alsace clover; Hybrid clover; Bastard clover; Swedish clover; White Swedish clover; Giant white clover; Perennial hybrid clover; Elegant clover; Pod clover. (Fig. 47.)

A perennial, in size and general appearance intermediate between white and red clover. It is better adapted than any other species in general cultivation to wet meadows or marshy lands, but because of its shallow root system will not withstand drought. The branching leafy stems grow 1 to 3 feet high, and the young flower heads are at first white and later become rose-colored. Its leaves are slightly bitter, and on this account the forage is not so well liked by stock as that of red or white clover; but it will grow on lands which are too wet for the other species, thriving even in marshy places where the subsoil is impervious to water and the drainage is bad. It may also be cultivated in the far North and in high altitudes, as it has the power of withstanding severe cold. The forage is succulent and more difficult to cure for hay than red clover. The air-dried hay contains from 10 to 13 per cent of crude protein. It is a very good honey plant for bees. The seed weighs 65 pounds to the bushel, and 12 pounds will sow an acre.

FIG. 48.—Crimson clover (*Trifolium incarnatum*).

Trifolium incarnatum L. Crimson clover; Scarlet clover; German clover; German mammoth clover; Italian clover; French clover, in part; Egyptian clover, in part; Carnation clover. (Fig. 48.)

An annual, native of the the Mediterranean region, which has been long cultivated in the warmer portions of Europe, and is now grown in many of the Eastern and Southern States for an early soiling crop. The stems are erect, tufted, soft-hairy all over, from 1 to 2 feet high, and the bright scarlet flowers are borne in elongated heads. In Virginia and southward it should be sown in autumn to furnish winter and early spring forage. It is susceptible to drought. It is not suited to the Northern and Northwestern States, as it suffers severely from excessive cold. Twenty pounds of seed should be sown per acre. Hay made of crimson clover

contains about 13 per cent of crude protein. To make the best hay, it must be cut when in full bloom; cut later, there is some danger in feeding it, especially to horses, on account of the bristly hairy bracts of the inflorescence, which form hair balls in the stomach. A number of such cases, resulting in considerable loss, have been reported during the past seasons.

Trifolium involucratum.

An annual 1 or 2 feet high, with leafy, branching stems, terminating in from 1 to 3 purplish heads. It has a wide range throughout the West.

Trifolium medium. Cow grass; Cow clover; Large American clover; Mammoth clover; Large clover; Fall clover; Saplin or sapling clover; Pea-vine clover;

FIG. 49.—*Trifolium megacephalum.*

FIG. 50.—Red clover (*Trifolium pratense*).

Meadow clover; Sand clover; Zigzag clover; Clover trefoil; Medium clover; Early clover; Wavy-stemmed clover; Zigzag hare clover; Red perennial meadow clover; Soiling clover; Perennial red clover.

A rank-growing perennial with zigzag stems, oblong, entire, spotless leaflets, and stalked heads of purple flowers. It is better adapted to wet meadows or marshy lands than is the ordinary clover, and in such places makes a very rank and rapid growth. It has about the same feeding value as red clover, and is well adapted to soiling purposes. Ten pounds of seed should be sown per acre.

Trifolium megacephalum. (Fig. 49.)

This wild clover grows in the mountains from Montana to California. It is distinguished from red clover, which it somewhat resembles, in having unbranched stems about a foot high, and wedge-shaped five to seven parted leaves which nearly all arise from the base of the stalks. The terminal flower head is about 1½ inches long. It is one of the best native pasture plants of that region.

Trifolium microcephalum.

A wild species, very common on lowlands in southern California, and well liked by stock. It should be valuable in cultivation.

Trifolium minus. Yellow clover.

A European annual, extensively naturalized in the Eastern and Southern States in sandy fields and along roadsides. It has a habit similar to that of Japan clover, for which it is often mistaken. It affords a small amount of forage in early summer, but its chief value is that it spreads rapidly over the most barren soils, and thereby prevents the washing away of the surface.

Trifolium ochroleucum. Sulphur clover.

A perennial European species 10 to 15 inches high, with elongated heads of pale yellow flowers. It grows wild upon the driest calcareous soils, and when cut makes a palatable and nutritious hay, which is greedily eaten by cattle.

Trifolium pannonicum. Hungarian clover.

A perennial species indigenous to southern Europe, closely allied to red clover and much earlier, but less readily eaten by stock.

Trifolium pratense. Red clover; June clover; Early clover; Small red clover; Red top clover; Medium red clover. (Fig. 50.)

A biennial or short-lived perennial clover, native of the Old World, but now extensively cultivated in both hemispheres. It is ascending, more or less branching, 1 to 2 feet high, with trifoliate leaves on long leaf-stalks and oval or blunt leaflets half an inch to an inch and a half long, with a large pale spot on the upper side, and pink flowers in large, rounded, stemless heads. Red clover holds the same position as a forage plant in the Eastern and Northern States as alfalfa in the Southwest and West, or as cowpeas in the South. Its cultivation is almost universal. The seed is sown at the rate of from 15 to 20 pounds per acre, from March to May, either alone, or more commonly with grain. It requires a deep, rich, fertile, calcareous loam, neither too wet nor too dry. On the black-waxy and gumbo soils of the Mississippi Valley, red clover is almost sure to freeze out or "heave" in winter, and on rocky or light, sandy soil it suffers from drought in summer. It is mown for hay twice in the season, the yield varying from three-fourths of a ton to 2 tons at each cutting. The hay contains from 12 to 16 per cent of crude protein, varying according to the fertility of the soil. The yield of seed ranges from 3 to 9 bushels, of 60 pounds each, per acre. It is one of the best money crops of the Eastern farmer, and is an excellent one for pasturage, soiling, hay, or to turn under for green manure.

Trifolium procumbens. Hop clover; Yellow clover; Shamrock clover; Brown clover; Lesser clover; Low hop clover; Hop trefoil.

A low, annual, yellow-flowered species, with spreading or ascending stems, widely naturalized in the Eastern and Southern States. It is common on sandy fields and roadsides, and furnishes scanty pasturage for stock in early summer. It resembles Japan clover, and in the South is often mistaken for it.

Trifolium reflexum. Buffalo clover; Pennsylvania clover. (Fig. 51.)

A native annual or biennial species with ascending downy stems, oblong, finely toothed leaflets, and rose-red flowers on short stalks in a round, stalked cluster. The flowers are reflexed and brownish in fruit. Widely disseminated from western New York to Nebraska, Kansas, and southward, and especially abundant in the middle prairie region, where it furnishes a considerable amount of palatable and highly nutritious forage, greedily eaten by all kinds of stock. It is a species which should be brought into cultivation.

Trifolium repens. White clover; White Dutch clover; Dutch clover; Creeping trifolium; White trefoil; Stone clover, in part; Honeysuckle; Honeysuckle grass; Honeysuckle clover; Shamrock. (Fig. 52.)

A smooth perennial, growing wild in New England and Europe, and now widely cultivated. The slender spreading and creeping stems are from 4 to 8 or 10 inches long; the trifoliate leaves are on rather long leafstalks; the flowers are white or rose color, borne in loose heads an inch or less in diameter, on very long stalks. It grows on a great variety of soils, forming excellent turf either for pastures or lawns, and thrives under all sorts of hard usage. If sown alone from 6 to 8 pounds of seed should be used, but it is usually mixed with the seed of grasses or other clovers. The forage, though produced in small quantity, is sweet and nutritious and eagerly sought for by all kinds of stock.

FIG. 51.—Buffalo clover (*Trifolium reflexum*).

FIG. 52.—White clover (*Trifolium repens*).

Trifolium resupinatum. Reversed clover.

An annual species, native of the Mediterranean region, similar to white clover in its manner of growth, and better adapted to warm regions than white clover. It has been introduced into and is largely grown in northern India as a pasture plant, and would be a valuable species to introduce for pasturage in the Southern States.

Trifolium rubens. Reddish clover; also known in Germany as Red clover; Fox clover; Fox tail clover; Red goat clover; Red hare clover.

A perennial species, native of southern Europe, similar in appearance to crimson clover, but with purple flowers and much narrower and longer leaflets. It is cultivated for soiling purposes in the warmer portions of Europe, and, though less hardy than the crimson clover, would be a good species for introduction into the Southern States.

Trifolium stoloniferum. Running clover; Running buffalo clover. (Fig. 53.)

A low, smooth perennial, which sends out long runners from the base of the stem. The flowers are white, tinged with purple, in loose heads. The leaflets are broadly obovate and minutely toothed. A native species, growing in open woodlands and prairies from Ohio west to Kansas, which is greedily eaten by cattle. It should be given a trial in cultivation.

Trifolium subrotundum. Mayad clover.

A perennial species, native to and cultivated in northern and middle Africa, up to 9,000 feet elevation. It is a good species for cultivation in countries too warm for red clover, and ought to do well in the Southern States.

Trifolium tridentatum.

A wild species, occurring in Nevada and Utah, which produces a palatable and nutritious forage in early summer, and is greedily eaten by cattle. It deserves to be brought under cultivation. The Western and Pacific Coast States are very rich in the number of wild clovers which occur there. California alone has more than sixty species. All are valuable forage plants, but few, if any, have ever been given a trial in cultivation.

Triglochin maritimum. Seaside arrow grass; Arrow grass.

A marsh plant with cylindrical leaves and flowering stalk 1 to 3 feet high, common along the Atlantic coast and westward across the continent in saline, marshy, and boggy places. It is eaten by cattle, and adds some little value to the native herbage of wet pastures.

Trigonella fœnum-græcum. Fenugreek; Buckhorn clover; Cow horn; Goat's horn; Sevenseed; Greek hay; Trigonel.

An erect annual legume growing 6 to 12 inches high. The plant has a strong odor, and is valueless for forage unless it is cut before the plant commences to bloom. The seeds are given to horses as a condiment. It is sometimes recommended for pasture mixtures, but has small value for any purpose.

FIG. 53.—Running buffalo clover (*Trifolium stoloniferum*).

Ulex europæus. Gorse; Whin; Furze. (Fig. 54.)

A perennial leguminous shrub, native of northern Europe, where it is highly esteemed as a forage plant for dry and barren hillsides, in places too steep or where the soil is too thin to admit of the cultivation of better ones. In some parts of Ireland and Wales the farm horses are almost entirely maintained upon it during the winter months, the crushed 2-year-old branches being fed at the rate of about 40 pounds per day. Twenty or 25 pounds of seed are required for an acre. It is a valuable forage plant to sow on barren hillsides. Sheep are very fond of and fatten quickly upon it.

Vicia americana. Common wild vetch.

A smooth perennial with compound leaves, elliptical or oblong obtuse leaflets, and 4 to 8 purple flowers on elongated flower stalks. It grows in moist soil from New York westward to the prairie region. A valuable native vetch, which should be given a trial in cultivation.

Vicia cracca. Bird vetch; Chicken vetch. (Fig. 55.)

A downy pubescent perennial with compound leaves of 20 to 24 narrowly oblong, abruptly pointed leaflets, and numerous blue or purple reflexed flowers in a one-sided spike. Common in the borders of thickets from New England to the upper prairie region. The species is cultivated in Europe for fodder, and is recommended for cultivation in wet meadows. In the shade it yields a return three times larger than in open places. It would, therefore, be valuable in woodland pastures and alpine regions.

FIG. 54.—Gorse (*Ulex europœus*).

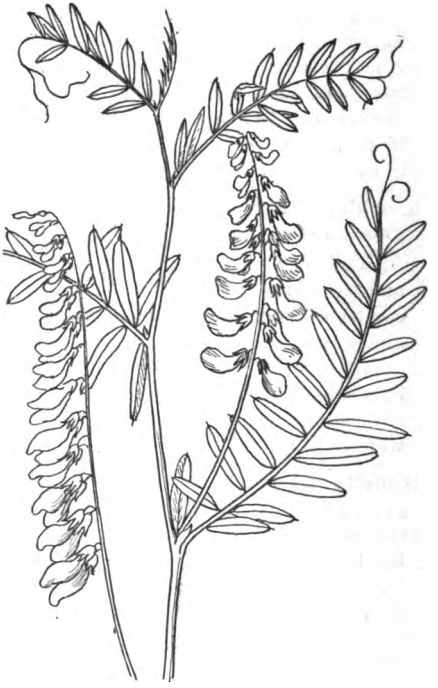

FIG. 55.—Bird vetch (*Vicia cracca*).

Vicia faba. Faba vulgaris.

Vicia gigantea.

A tall perennial, growing in the forest regions of Oregon and Washington, and highly valued there as a forage plant. It deserves to be brought into cultivation.

Vicia ludoviciana. Louisiana vetch.

A wild vetch, occurring in the southern prairie region and in the Southern States, where it makes a fair amount of nutritious grazing.

Vicia micrantha. Small flowered vetch.

A smooth vetch, with 4 to 6 linear obtuse leaflets, common throughout the Southern States. It is eaten by cattle wherever it occurs, and should be grown under improved conditions.

Vicia peregrina.

An annual, native of southern Europe and cultivated there, and considered better than the ordinary vetch for sandy soils. It would be valuable for like soils in the South.

Vicia sativa. Vetch; Spring vetch; Tares.

An annual trailing herb 12 to 20 inches high, with 4 to 5 angled stems, simple or branched from the base. The leaflets are broadest above the middle, blunt or notched at the end, and tipped with an abrupt point; they number usually from 10 to 14. The rather large purple flowers are borne one or two together at the base of a leaf. The plant is soft-hairy all over. This native of Europe and western Asia has been cultivated for upward of twenty centuries, and is considered one of the best soiling crops in cool, moist climates. In the United States they have only proved adaptable to cultivation in the New England States and Canada. Vetches are sown in April or May, at the rate of 2 bushels of seed per acre, and the crop is ready to cut by the middle of June or the first of July. Where they can be grown, they are a very good summer feed for horses, but must not be fed earlier than full bloom, on account of their diuretic action. They are good for soiling sheep and milch cows, and are said to very materially increase the flow of milk. Because of the high price asked for seed, and the extreme susceptibility of vetches to dry, hot weather, their cultivation is not recommended. A greater and surer return can always be had from red clover.

Vicia sitchensis.

A native of the Pacific Coast from California to Alaska, valuable for forage, and deserving cultivation.

Vicia sylvatica. Wood vetch.

A perennial indigenous to Europe and northern Asia. It has been grown successfully as far north as 67° north latitude and is available for alpine or subalpine pastures. The yield of forage is large and it is readily eaten by all kinds of stock.

Vicia tetrasperma. Lentil vetch; Lentil tare.

An Old World annual which, according to Langethal, is preferable to the ordinary vetch for sandy soil. It also makes a better and more palatable forage. It is suited to cultivation in the Southern States, especially upon light, calcareous soils.

Vicia villosa. Hairy vetch; Sand vetch; Russian vetch. (Fig. 56.)

An annual, native to western Asia, which has been cultivated for about fifty years. Hairy vetch is an excellent soiling crop, one of the best that has been introduced into the United States, although, on account of the high price of the seed and the large amount which must be sown per acre, it has not been widely cultivated. The seed should be sown at the rate of a bushel and a half per acre, from the latter part of April to the middle of May for summer forage, or from the middle of August to the middle of September for winter forage. The nutritive value of the hay is very high, analyses by Coudon in 1890 showing 23 per cent of crude protein. The yield varies from 1½ to 4 tons per acre, according to the fertility of the soil. It has been grown successfully in all parts of the country and has proved to be hardy in the moist coastal regions of Washington, the dry prairies of South Dakota, and the rich loamy soils along the Gulf. It is deserving of wider cultivation in all parts of the United States.

Vigna catjang. Cowpea; Southern cowpea; Pea; Field pea; Stock pea; Cherry bean; Chinese vetch.

A leguminous annual of unknown origin, which has been cultivated in oriental countries for many centuries, both as a forage plant and for the seeds as an arti-

cle of human diet. It is especially adapted to warm countries and is extensively cultivated throughout the South, having been introduced there about the middle of last century. There are many named forms or cultural varieties, all of which, however, are considered by botanists to be derived from one species. It so readily adapts itself to different soils and changes its characters so readily under cultivation, that there has been much difficulty in determining the limits of the various named forms. The cowpeas are of three general classes, according to their habit of growth, consisting of "bunch" varieties, which grow erect and compact; "runners," which start off erect and then throw out running branches; and "trailers," which grow flat upon the ground with long stems sometimes 15 or 20 feet in length. There is also much variation in size, shape, and color markings of the seeds, and in the manner in which the seeds are borne in the pod, the seeds of some being closely crowded together, called "crowders," and others with the seeds wide apart and the pods constricted between each seed, called "kidney" peas. The bunch varieties are the ones which are best adapted to growing for hay or ensilage, while the runners and trailers are valuable for soiling purposes or for turning under as green manure. The length of season required for maturity also varies greatly, the bunch varieties, as a rule, requiring only a very short season. The feeding value of cowpeas, either green, fed as hay, or preserved as ensilage, is very high, being considerably above that of red clover. Cowpeas require a deep, rich, sandy loam, although, because of their strong root system, they are adapted to grow upon almost any soil which is not too wet. The ground should be well prepared and the seed should not be sown until the soil is thoroughly warmed. Cowpeas, by means of the tubercles on the roots, gather large amounts of nitrogen from the air, and also pump up large amounts of valuable mineral fertilizers from the subsoil. When the stubble is plowed under after the crop has been removed, these valuable fertilizing elements—potash, nitrogen, and phosphoric acid—are left in the surface soil for the use of succeeding crops. At the Rhode Island Experiment Station the total crop of green vines per acre was 35,000 pounds, containing 157 pounds of nitrogen, 109½ pounds of potash, and 32.2 pounds of phosphoric acid, and the additional quantity estimated to be contained in the roots was 17¾ pounds nitrogen, 10 pounds of potash, and 5.15 pounds phosphoric acid. The percentages of fertilizers vary greatly, according to the fertility, and to some extent according to the variety grown. Experi-

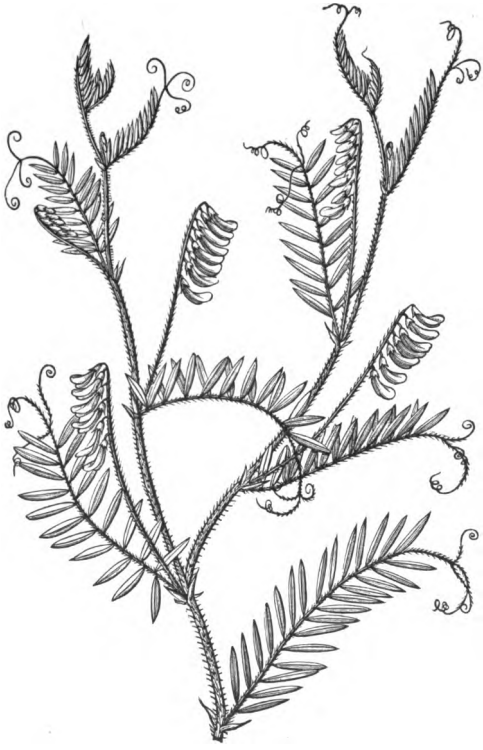

FIG. 56.—Hairy vetch (*Vicia villosa*).

ments at Southern stations have unanimously proved that the best way to utilize fertilizers so produced by a crop of cowpeas is to cut the vines for hay, returning the manure to the fields. A common practice is to plow under a crop at the end of the season, or sometimes to permit it to remain on the ground through the winter, both of which methods result in a loss of a very large part of the value of a crop through leaching. The best method, if the crop is turned under, is to at once plant a winter forage crop to cover the surface of the ground and so prevent washing by the winter rains. The cultivation of cowpeas has extended to California. Some of the varieties having a short season may be grown in the prairie region as far north as Iowa and Nebraska, and are there of considerable value for dairying purposes, because of their resistance to drought, furnishing on rich soil a palatable and nutritious food during the hottest and driest summer months.

Yucca baccata. Spanish bayonet; Bear grass.

A perennial of the Lily family, with stout, woody trunk several feet high, crowned at the top with a rosette of long sword-shaped leaves. Of no value as a forage plant except in seasons of drought, when the cattle and sheep on the ranges of Texas and Arizona, where it grows, eat the leaves, perhaps as much for the water which they contain as for food.

COMMON ENGLISH OR LOCAL NAMES OF FORAGE PLANTS.

[This list serves as an index to the Latin names, which are arranged alphabetically in the body of the work.]

Alexandrine Clover: *Trifolium alexandrinum.*
Alfalfa: *Medicago sativa.*
Alfilaria: *Erodium cicutarium.*
Alpine Clover: *Trifolium alpinum.*
Alsace Clover: *Trifolium hybridum.*
Alsike Clover: *Trifolium hybridum.*
Arabian Snail Clover: *Medicago maculata.*
Arrow Grass: *Triglochin maritimum.*
Artichoke: *Helianthus tuberosus.*
Aspercet: *Onobrychis sativa.*
Australian Salt Bush: *Atriplex semibaccátum.*
Banana Field Pea: *Dolichos multiflorus.*
Banana Stock Pea: *Dolichos multiflorus.*
Bastard Clover: *Trifolium hybridum.*
Lucern: *Medicago media.*
Pod Clover: *Trifolium hybridum.*
Bear Grass: *Yucca baccata.*
Beckwith's Clover: *Trifolium beckwithii.*
Bee Clover: *Trifolium repens.*
Beggar Weed: *Desmodium tortuosum.*
Bellfountain: *Richardsonia scabra.*
Bersin Clover: *Trifolium alexandrinum.*
Big-headed Bog Rush: *Juncus nodosus.*
Weed: *Amaranthus.*
Birds-foot: *Ornithopus sativus.*
Clover: *Lotus corniculatus.*
Trefoil: *Lotus corniculatus.*
Bird Vetch: *Vicia cracca.*
Black Grass: *Juncus gerardi; Medicago lupulina.*
Medick: *Medicago lupulina.*
Nonesuch: *Medicago lupulina; Trifolium procumbens.*
Bladder Clover: *Trifolium fragiferum.*
Salt Bush: *Atriplex vesicarium.*
Blazing Star: *Liatris.*
Blood Clover: *Trifolium incarnatum.*
Blue Canada Field Pea: *Pisum arvense.*
Lupine: *Lupinus hirsutus.*
Bokhara Clover: *Melilotus alba.*
Bourgoyne: *Onobrychis sativa.*
Brabant Clover: *Trifolium pratense.*
Branching Clover: *Medicago sativa.*
Brazilian Clover: *Medicago sativa.*
Breast Clover: *Anthyllis vulneraria.*
Broad Bean: *Faba vulgaris.*
Clover: *Trifolium pratense.*
-leafed Clover: *Trifolium pratense.*
Brown Clover: *Trifolium procumbens; T. badium.*
Buckhorn Clover: *Trigonella fœnum-græcum.*
Buckwheat: *Fagopyrum esculentum.*
Buffalo Clover: *Astragalus caryocarpus; Trifolium reflexum.*
Pea: *Astragalus caryocarpus.*
Burnet Clover: *Poterium sanguisorba.*
Burnet or Burnette: *Poterium sanguisorba.*
Bur Clover: *Medicago denticulata; M. maculata.*
Bush Clover: *Lespedeza frutescens; L. striata.*
Lespedeza: *Lespedeza cyrtobotrya.*
Butterfly Pea: *Clitoria mariana.*
Butter Weed: *Erigeron canadensis.*
Button Snakeroot: *Liatris.*
Cabbage: *Brassica oleracea.*
Cabul Clover: *Melilotus alba.*
California Clover: *Medicago maculata.*
Canadian Field Pea: *Pisum arvense.*
Milk Vetch: *Astragalus canadensis.*
Careless Weed: *Amaranthus.*
Carnation Clover: *Trifolium incarnatum* (English).
Carob Bean: *Ceratonia siliqua.*
Tree: *Ceratonia siliqua.*
Carolina Clover: *Trifolium carolinianum.*
Cassava: *Manihot aipi.*
Cat Clover: *Anthyllis vulneraria; Trifolium arvense.*
Cat-in-clover: *Lotus corniculatus.*
Cherry Bean: *Vigna catjang.*
Chestnut-brown Clover: *Trifolium badium.*
-colored Sedge: *Cyperus erythrorhizos.*
Chicken Vetch: *Vicia cracca.*
Chick Pea: *Cicer arietinum.*
Chicory: *Cichorium intybus.*
Chilian Clover: *Medicago sativa.*
China Grass Plant: *Bœhmeria nivea.*
Chinese Vetch: *Vigna catjang.*
Yam: *Dioscorea batatas.*
Chufa: *Cyperus esculentus.*
Cinquefoil: *Potentilla.*
Cloth Plant: *Bœhmeria nivea.*
Clover: *Trifolium pratense.*
of Roussillon: *Trifolium incarnatum.*
Trefoil: *Trifolium medium.*
Cocks-head: *Desmodium tortuosum; Onobrychis sativa.*
Coffee Bean: *Glycine hispida.*
Pea: *Cicer arietinum.*
Comfrey: *Symphytum asperrimum.*
Common Buckwheat: *Fagopyrum esculentum.*
Clover: *Trifolium repens; T. pratense.*
Field Bean: *Faba vulgaris.*
Kidney Vetch: *Anthyllis vulneraria.*
Red Clover: *Trifolium pratense.*
Common Spike Rush: *Eleocharis palustris.*
Vetch: *Vicia sativa.*
Wild Vetch: *Vicia americana.*
Corn Spurrey: *Spergula arvensis.*

Cow Clover: *Trifolium medium.*
Grass: *Trifolium medium.*
Horn: *Trigonella fœnum-græcum.*
Pea: *Vigna catjang.*
Cranes-bill: *Erodium moschatum.*
Creeping Bush Clover: *Lespedeza procumbens.*
Clover: *Trifolium repens.*
Kidney Bean: *Phaseolus diversifolius.*
Trefoil: *Trifolium repens.*
Crimson Clover: *Trifolium incarnatum.*
Cultivated Medick: *Medicago sativa.*
Dandelion: *Taraxacum dens leonis.*
Deer Brush: *Adenostoma sparsifolium.*
Weed: *Hosackia glabra.*
Dog Clover: *Melilotus officinalis.*
Door Weed: *Polygonum aviculare.*
Dooryard Grass: *Polygonum aviculare.*
Dwarf Essex Rape: *Brassica napus.*
Sedge: *Carex stenophylla.*
Duckweed: *Polygonum aviculare.*
Dutch Clover: *Trifolium repens.*
Early Clover: *Trifolium pratense.*
Maturing Soja Bean: *Glycine hispida.*
Earth Nut: *Arachis hypogœa.*
Egyptian Clover: *Trifolium alexandrinum; T. incarnatum.*
Elegant Clover: *Trifolium hybridum.*
Elliott's Sida: *Sida elliottii.*
Endives: *Cichorium endivium.*
English Clover: *Trifolium pratense.*
Esparcette: *Onobrychis sativa.*
Clover: *Onobrychis sativa.*
Esparsette: *Onobrychis sativa.*
Everlasting Pea: *Lathyrus polymorphus.*
Farouche: *Trifolium incarnatum* (French).
Fenugreek: *Trigonella fœnum-græcum.*
Field Clover: *Trifolium arvense; T. agrarium.*
Pea: *Pisum arvense; Vigna catjang.*
Filaree: *Erodium cicutarium.*
Filaria: *Erodium cicutarium.*
Fir Clover: *Anthyllis vulneraria.*
Five-finger: *Potentilla.*
Flat Pea: *Lathyrus sylvestris.*
Flesh-colored Clover: *Trifolium incarnatum.*
Florida Beggar Weed: *Desmodium tortuosum.*
Clover: *Richardsonia scabra*; *Desmodium tortuosum.*
Fodder Clover: *Medicago sativa.*
Forest Pea: *Lathyrus sylvestris.*
Fox Clover: *Trifolium rubens.*
Sedge: *Carex vulpinoidea.*
-tail Clover: *Trifolium rubens.*
French Clover: *Medicago sativa; Trifolium incarnatum.*
Honeysuckle: *Hedysarum coronarium.*
Lucern: *Medicago sativa.*
Furze: *Ulex europœus.*
Garden Pea: *Pisum sativum.*
German Clover: *Trifolium incarnatum.*
Mammoth Clover: *Trifolium incarnatum.*
Giant Clover: *Melilotus officinalis.*
Knotweed: *Polygonum sachalinense.*
Giant Sedge: *Carex aristata.*
Spurrey: *Spergula maxima.*
White Clover: *Trifolium hybridum.*
Glasswort: *Salicornia herbacea.*
Goat Clover: *Galega officinalis.*
Goatshorn: *Trigonella fœnum-græcum.*
Rue: *Galega officinalis.*
Gold-colored Clover: *Trifolium agrarium.*
Golden Clover: *Trifolium agrarium; T. filiforme; T. procumbens; T. badium.*
Golden Rod: *Solidago.*
Goober: *Arachis hypogœa.*
Pea: *Arachis hypogœa.*
Goosefoot: *Chenopodium.*
Goose Grass: *Polygonum aviculare.*
Gorse: *Ulex europœus.*
Gram: *Cicer arietinum.*
Gray Clover: *Trifolium arvense.*
Winter Pea: *Pisum arvense.*
Greasewood: *Sarcobatus vermicularis.*
Greek Hay: *Trigonella fœnum-græcum.*
Green Clover: *Trifolium medium.*
Ground Almond: *Cyperus esculentus.*
Nut: *Arachis hypogœa*; *Apios tuberosa.*
Gunaninpil: *Allionia incarnata.*
Hair Clover: *Trifolium arvense.*
Hairy Bush Clover: *Lerpedeza polystachya.*
Prairie Clover: *Petalostemon villosus.*
Vetch: *Vicia villosa.*
Hall's Rush: *Scirpus hallii.*
Hard Clover: *Trifolium arvense.*
Haresfoot: *Trifolium arvense.*
Hareshead: *Onobrychis sativa.*
Hare's Little Paw: *Trifolium arvense.*
Hart's Clover: *Melilotus officinalis.*
Heart Clover: *Medicago maculata.*
Hemp Clover: *Melilotus officinalis; M. alba.*
Hog Nut: *Cyperus esculentus.*
Peanut: *Amphicarpia monoica.*
Honey Locust: *Gleditschia triacanthos.*
Honeysuckle: *Hedysarum coronarium.*
Clover: *Trifolium repens.*
Grass: *Trifolium repens.*
Hoop-koop: *Lespedeza striata.*
Hop Clover: *Medicago lupulina; Trifolium procumbens; T. agrarium.*
Snail Clover: *Medicago lupulina.*
Horned Clover: *Lotus corniculatus.*
Horse Bean: *Faba vulgaris.*
Clover: *Melilotus officinalis; M. alba.*
Weed: *Erigeron canadensis.*
Horse-shoe Vetch: *Hippocrepis comosa.*
Huajillo: *Pithecolobium brevifolium.*
Hungarian Clover: *Trifolium pannonicum.*
Hybrid Clover: *Trifolium hybridum.*
Ipecac Weed: *Richardsonia scabra.*
Italian Clover: *Trifolium incarnatum.*
Japan Bush Clover: *Lespedeza cyrtobotrya.*
Clover: *Lespedeza striata.*
Japanese Buckwheat: *Fagopyrum esculentum.*
Jesuit's Tea: *Psoralea glandulosa.*
June Clover: *Trifolium pratense.*
Kidney Vetch: *Anthyllis vulneraria.*
King Grass: *Lespedeza striata.*
King's Clover: *Melilotus officinalis.*
Knotweed: *Polygonum aviculare.*
Lady's Finger: *Anthyllis vulneraria.*
Lamb Clover: *Trifolium repens.*
Lamb's Quarters: *Chenopodium album.*
Lamb's Tail: *Trifolium arvense.*

Large American Clover: *Trifolium medium.*
Golden Clover: *Trifolium agrarium.*
White Clover: *Melilotus alba.*
Late-fruited Sedge: *Carex retrorsa.*
Leafy Prairie Clover: *Petalostemon foliosus.*
Lentil: *Ervum lens.*
Lentil Tare: *Vicia tetrasperma.*
Vetch: *Vicia tetrasperma.*
Lesser Clover: *Trifolium procumbens.*
Little Yellow Hop Clover: *Trifolium filiforme.*
Long Moss: *Tillandsia usneoides.*
-stalked Kidney Bean: *Phaseolus helvolus.*
Louisiana Vetch: *Vicia ludoviciana.*
Low Hop Clover: *Trifolium procumbens.*
Lucern: *Medicago sativa.*
Medicago: *Medicago sativa.*
Lupine: *Lupinus albus; L. luteus; L. perennis.*
Madder: *Rubia tinctoria.*
Maltese Clover: *Hedysarum coronarium.*
Mammoth Clover: *Trifolium medium.*
Manured Medick: *Medicago sativa.*
Marl Grass: *Trifolium pratense; T. medium.*
Mayad Clover: *Trifolium subrotundum.*
Meadow Pea: *Lathyrus pratensis.*
Rush: *Scirpus atrovirens.*
Medick: *Medicago sativa.*
Bur: *Medicago denticulata.*
Clover: *Medicago denticulata.*
Vetchling: *Onobrychis sativa.*
Medium Clover: *Trifolium medium.*
Red Clover: *Trifolium pratense.*
Melilot Clover: *Melilotus officinalis.*
Mesquite Tree: *Prosopis juliflora.*
Mexican Clover: *Medicago sativa; Richardsonia scabra.*
Milk Pea: *Galactia pilosa.*
Milfoil: *Achillea millefolium.*
Modiola: *Modiola decumbens.*
Mouse Clover: *Trifolium arvense.*
Narrow-fruited Sedge: *Carex sychnocephala.*
Native Red Clover: *Trifolium pratense.*
New Zealand Spinach: *Tetragonia expansa.*
Nigger Head: *Carex.*
Wool: *Carex.*
Nonesuch: *Medicago lupulina.*
Nopal: *Opuntia engelmanni.*
Old Sow: *Trigonella fœnum-græcum.*
Pea: *Pisum arvense; Vigna catjang.*
Peanut: *Arachis hypogœa.*
Pea Vine Clover: *Trifolium medium.*
Pennsylvanian Clover: *Trifolium reflexum.*
Perennial Hybrid Clover: *Trifolium hybridum.*
Red Clover: *Trifolium medium.*
Piedmont Clover: *Trifolium pratense.*
Pigeon Weed: *Richardsonia scabra.*
Pigweed: *Amaranthus; Chenopodium.*
Pin Clover: *Erodium cicutarium.*
Grass: *Erodium cicutarium.*
Weed: *Erodium cicutarium.*
Plantain: *Plantago lanceolata.*
Herb: *Plantago lanceolata.*
Plaster Clover: *Melilotus officinalis.*
Pomme Blanche: *Psoralea esculenta.*
de Prairie: *Psoralea esculenta.*
Poor Toe: *Richardsonia scabra.*
Prairie Clover: *Petalostemon candidus; P. violaceus.*
Prairie Turnip: *Psoralea esculenta.*
Prickly Comfrey: *Symphytum asperrimum.*
Pear: *Opuntia engelmanni.*
Purple Bush Clover: *Lespedeza violacea.*
Clover: *Trifolium pratense.*
Medick: *Medicago sativa.*
Prairie Clover: *Petalostemon violaceus.*
Purslane: *Portulaca oleracea.*
Pusley: *Portulaca oleracea.*
Pussywort: *Trifolium arvense.*
Rabbit-foot Clover: *Trifolium arvense.*
Ramie: *Bœhmeria nivea.*
Ram's Horn: *Cicer arietinum.*
Rape: *Brassica napus.*
Rattle Pod: *Astragalus hypoglottis.*
Red Clover: *Trifolium pratense.*
Reddish Clover: *Trifolium rubens.*
Red Dutch Clover: *Trifolium pratense.*
Hare Clover: *Trifolium rubens.*
Meadow Clover: *Trifolium pratense.*
Redtop Clover: *Trifolium pratense.*
Reversed Clover: *Trifolium resupinatum.*
Rib Grass: *Plantago lanceolata.*
Herb: *Plantago lanceolata.*
Ripple Grass: *Plantago lanceolata.*
River Club Rush: *Scirpus fluviatilis.*
Round-headed Bush Clover: *Lespedeza capitata.*
Snail Clover: *Medicago orbicularis.*
Running Buffalo Clover: *Trifolium stoloniferum.*
Clover: *Trifolium stoloniferum.*
Russian Vetch: *Vicia villosa.*
Sacaline: *Polygonum sachalinense.*
Sachaline: *Polygonum sachalinense.*
Sage Brush: *Atriplex canescens.*
Saghalin Polygonum: *Polygonum sachalinense.*
Sainfoin: *Onobrychis sativa.*
St. John's Bread: *Ceratonia siliqua.*
St. Mawe's Clover: *Medicago maculata.*
Salad Burnet: *Poterium sanguisorba.*
Saleratus Weed: *Salicornia herbacea.*
Salt Bush: *Atriplex semibaccatum.*
Salt Bush No. 2: *Atriplex leptocarpum.*
Samphire: *Salicornia herbacea.*
Sand Clover: *Anthyllis vulneraria.*
Spurrey: *Spergula arvensis.*
Vetch: *Vicia villosa.*
Sanfoin: *Onobrychis sativa.*
Sapling Clover: *Trifolium medium.*
Scarlet Clover: *Trifolium incarnatum.*
Scented Yellow Lupine: *Lupinus luteus.*
Scotch Broom: *Genista scoparia.*
Screw Bean: *Prosopis juliflora; P. pubescens.*
Sea Club Rush: *Scirpus maritimus.*
Seaside Arrow Grass: *Triglochin maritimum.*
Sensitive Brier: *Schrankia.*
Sensitive Plant: *Schrankia uncinata; S. angustata.*
Serradella: *Ornithopus sativus.*
Seven Seed: *Trigonella fœnum-græcum.*
Shad Scale: *Atriplex canescens; A. confertifolia.*
Shamrock: *Trifolium repens; Medicago lupulina.*
Clover: *Trifolium procumbens.*
Sheep Clover: *Trifolium repens.*
Sherman's Clover: *Lespedeza striata.*
Silver Hull Buckwheat: *Fagopyrum esculentum.*
Silvery-topped Sedge: *Carex siccata.*

Slender Bog Rush: *Juncus tenuis.*
-fruited Saltbush: *Atriplex leptocarpum.*
-stalked Clover: *Trifolium filiforme.*
Small-flowered Clover: *Trifolium filiforme.*
Vetch: *Vicia micrantha.*
Red Clover: *Trifolium pratense.*
Smartweed: *Polygonum.*
Smooth Milk Pea: *Galactia glabella.*
Snail Clover: *Medicago turbinata.*
Soiling Clover: *Trifolium medium.*
Soja Bean: *Glycine hispida.*
Soola Clover: *Hedysarum coronarium.*
Sotol: *Dasylirion texanum.*
Southern Cowpea: *Vigna catjang.*
Soy Bean: *Glycine hispida.*
Spanish Bayonet: *Yucca baccata.*
Clover: *Trifolium pratense; Richardsonia scabra.*
Moss: *Tillandsia usneoides.*
Peanut: *Arachis hypogæa.*
Sainfoin: *Hedysarum coronarium.*
Trefoil: *Medicago sativa.*
Spotted Clover: *Galega officinalis.*
Medick: *Medicago maculata.*
Spring Vetch: *Vicia sativa.*
Spurred Butterfly Pea: *Centrosema virginianum.*
Spurrey: *Spergula arvensis.*
Square Pod Pea: *Lotus tetragonolobus.*
Stock Pea: *Vigna catjang.*
Stone Clover: *Medicago falcata; Trifolium arvense.*
Storksbill: *Erodium cicutarium.*
Straight Bean: *Faba vulgaris.*
Strawberry Clover: *Trifolium fragiferum.*
-headed Trefoil: *Trifolium fragiferum.*
Straw-colored Sedge: *Carex straminea.*
Succulent Clover: *Trifolium pratense.*
Suckling Clover: *Trifolium filiforme.*
Sulla: *Hedysarum coronarium.*
Sulphur Clover: *Trifolium ochroleucum.*
Summer Lentil: *Ervum lens.*
Sunflower: *Helianthus annuus.*
Sunn: *Crotalaria juncea.*
Hemp: *Crotalaria juncea.*
Swamp Horn Clover: *Lotus uliginosus.*
Swedes: *Brassica napus.*
Swedish Clover: *Trifolium hybridum.*
Turnips: *Brassica napus.*
Sweet Cassava: *Manihot aipi.*
Clover: *Melilotus alba.*
Potato: *Convolvulus edulis.*
Sage: *Eurotia lanata.*
scented Clover: *Melilotus alba.*
Trefoil: *Lotus corniculatus.*
Tagasaste: *Cytisus proliferus albus.*
Tares: *Vicia sativa.*
Tarweed: *Madia sativa.*
Thread Clover: *Trifolium filiforme.*
Tick Trefoil: *Desmodium canadense.*
Toothed Medick: *Medicago denticulata.*
Tornillo: *Prosopis pubescens.*
Tree Clover: *Melilotus alba.*
Trigonel: *Trigonella fœnum-græcum.*
Tufted Spike Rush: *Eleocharis obtusa.*
Tula Grass: *Cyperus strigosus.*
Tule: *Cyperus strigosus.*
Tumbleweed: *Amaranthus.*
Turkestan Alfalfa: *Medicago sativa.*
Turkish Clover: *Trifolium pratense.*
Upright Knotweed: *Polygonum erectum.*
Sedge: *Carex stricta.*
Velvet Bean: *Dolichos multiflorus.*
Vetch: *Vicia sativa.*
Violet Clover: *Lespedeza violacea.*
Water Grass: *Carex; Eleocharis; Scirpus; Cyperus. Carex muricata.*
Parsley: *Richardsonia scabra.*
Welsh Clover: *Trifolium arvense.*
West Indian Honeysuckle: *Desmodium.*
Whin: *Ulex europæus.*
White Bokhara Clover: *Melilotus alba.*
Canada Field Pea: *Pisum arvense.*
Clover: *Trifolium repens.*
Dutch Clover: *Trifolium repens.*
Giant Clover: *Melilotus alba.*
Lupine: *Lupinus albus.*
Meadow Trefoil: *Trifolium repens.*
Prairie Clover: *Petalostemon candidus.*
Sage: *Atriplex confertifolia; Eurotia lanata.*
Swedish Clover: *Trifolium hybridum.*
Trefoil: *Trifolium repens.*
Wild Buckwheat: *Polygonum.*
Kidney Bean: *Phaseolus perennis.*
Laburnum: *Melilotus officinalis.*
Vetch: *Hosackia purshiana.*
Winter Fat: *Eurotia lanata.*
Flat Pea: *Lathyrus cicer.*
Lentil: *Ervum lens.*
Rape: *Brassica napus.*
Vetch: *Lathyrus hirsutus; Vicia villosa.*
Wonder Clover: *Melilotus alba.*
Wood Pea: *Lathyrus sylvestris.*
Vetch: *Vicia sylvatica.*
Wound Clover: *Anthyllis vulneraria.*
Wort: *Anthyllis vulneraria.*
Yam: *Dioscorea batatas.*
Yarrow: *Achillea millefolium.*
Yellow Clover: *Trifolium procumbens; T. agrarium; T. minus; Lotus corniculatus; Medicago lupulina.*
Hop Clover: *Trifolium agrarium.*
Lucern: *Medicago falcata; M. lupulina.*
Lupine: *Lupinus luteus.*
Meadow Trefoil: *Trifolium agrarium.*
Moon Trefoil: *Medicago falcata.*
Sand Trefoil: *Anthyllis vulneraria.*
Suckling Clover: *Trifolium filiforme.*
Sweet Clover: *Melilotus officinalis.*
Trefoil: *Lotus corniculatus.*
Zigzag Clover: *Trifolium medium.*